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ENGINEERING AND MINING JOURNAL

A Consolidation of Engineering and Mining Journal and Mining and Scientific Press

METAL AND NON-METALLIC MINING · MILLING · SMELTING · REFINING · MARKETING

Aërial Mapping in Canada

By E. G. Wilson

Pegmatite Mining in the Black Hills

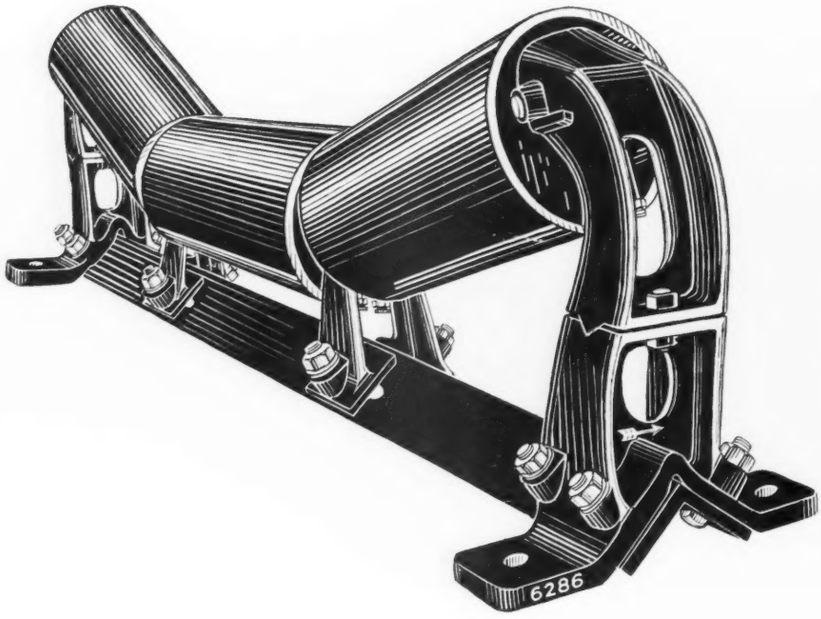
By Francis Church Lincoln

The Jaw Crusher as a Secondary Breaker

By W. T. W. Miller

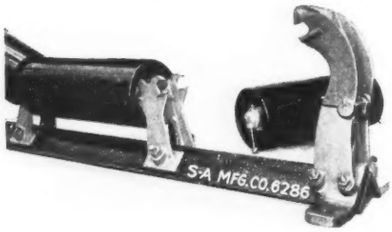
Biography of
Alexander Grant
McGregor

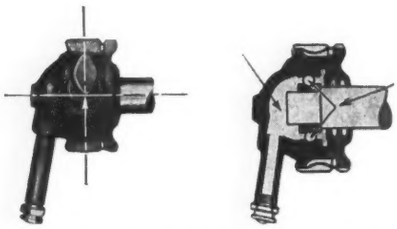
"Why conveyor belts last longer"



Conveyor before belt was installed.

Outer brackets are hinged, roller and bearings are easily removed for inspection





The cut above at the left shows the balanced suspension of oscillating housing. Cut at the right shows radial and thrust loads carried on ball bearings and grease cavity with multiple grease seal.

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Volume 123 June 18, 1927 Number 25

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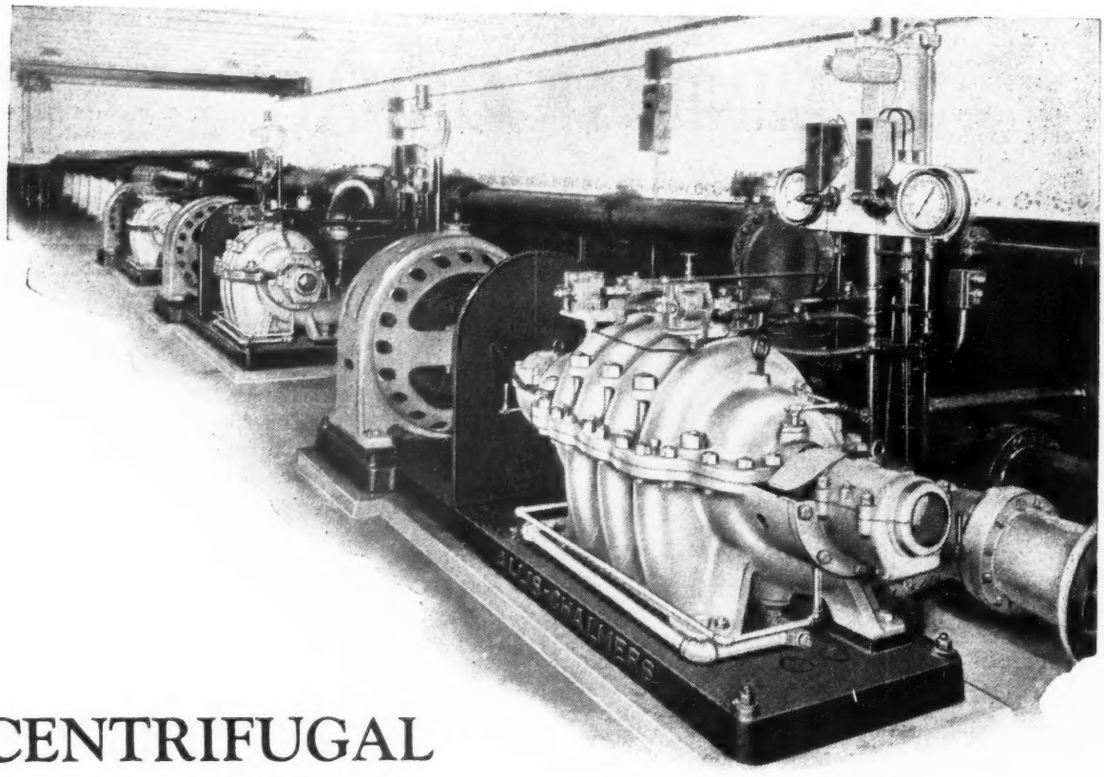


CENTRIFUGAL MINE PUMPS

Built for endurance

The illustration shows three of the four 10 in. x 8 in. four stage bronze mine pumps installed by the Lehigh Valley Coal Co. in 1923. No repairs have been ordered since this installation was placed in service. Another example of still more enduring service is the 16 in. six stage bronze mine pump furnished the D. L. & W. Ry. Co. in 1909 which is still in service with the original Casings. Allis-Chalmers mine pumps may cost a little more at first but there is extra metal where needed and other special features which make for enduring service.

ALLIS-CHALMERS

MILWAUKEE, WIS., U. S. A.

ENGINEERING AND
MINING JOURNAL

Volume 123 New York, June 18, 1927 *Number* 25

Lindbergh, and What He Typifies

AS THIS IS BEING WRITTEN, only one subject seems of sufficient importance for editorial treatment, whether one is speaking to mining engineers or to all persons; whether to Americans alone or to the far-flung peoples that this magazine reaches. Lindbergh, America's greatest ambassador, international hero, alone is in the minds of us all. How fortunate that this young man should be not only supreme in his chosen field—aviation—but that he should be possessed of such rare tact, diplomacy, and good taste. He has done more to promote friendly relations between the United States and the rest of the world than has any one since the end of the war, and he has done it at a time when it was most helpful.

But the adulation that the world is bestowing on Lindbergh—and on Chamberlin too—has a deeper foundation than that of personal achievement. Had he swum the Atlantic Ocean, or had he driven a locomotive from New York to San Francisco in twenty-four hours, the feat would have been even more startling, but it would have commanded less acclaim. The international celebration marks the reaching of a goal in a new form of transportation comparable with the first long voyage of a ship and the first sustained trip by rail or motor car. It marks the conquering by man of the third and last earthly element available for transportation and communication. What more fitting than that the Washington homecoming should be broadcast to some thirty million radio listeners in North America through fifty-one broadcasting stations, and, by short-wave transmission, carried to the peoples of Europe, Africa, and South America, if not all the world. Thus are the wonders of aërial communication added to those of aërial transportation.

How can the mining industry use this new tool? Two articles in this issue are indicative of what has already been done with the airplane in mapping and developing new areas. Mining engineers are already familiar with the transportation of men and supplies into out-of-the way mining camps, as at Rouyn, Quebec; with the carrying out of high-grade concentrate as has been done in the Northwest; and with aërial prospecting as practiced in central Africa, where outcrops of ore affect the appearance of the vegetation to such an extent that they can be quickly detected. In Central America, too, as told on the Personal page of this issue, the airplane has been recently employed in prospecting.

The flights of Lindbergh and Chamberlain epitomize the progress that has been made in this new art and the present reliability of the available equipment. It is now for the mining and other industries to capitalize on this development, to utilize the airplane to an increasing extent in ways that are already known, and to devise new uses for it. The western United States were developed by the steam railroad; perhaps the upper third of North America and vast areas in Asia and other continents will be opened up by aërial routes. One's imagination may be allowed full play.

Investment in Mining vs. Foreign Loans

ONE OF THE MOST IMPORTANT of America's recent financial problems is the proper investment of surplus funds. Never before in the United States has so much money been so freely available over so long a period, the great flow of gold imports being chiefly responsible. In seeking for an outlet, foreign investments have been attractive, both from the standpoint of the comparatively high rate of return and because it has been thought that capital was badly needed in most foreign countries and that investments made abroad would not only benefit the countries themselves but would stimulate America's trade with those countries. Few realize how heavy the volume of foreign financing has been; about a billion dollars a year has thus been transferred to foreign interests for some years, and in the first quarter of 1927 foreign issues sold in American markets totaled over 360 millions. Thus is America becoming a creditor nation, apart from war settlements.

It must be remembered, however, that the money itself is not going abroad. It is being spent in this country for goods, which are, in turn, exported, which is the reason why our exports have been so enormous. But ultimately, if the current trend continues, the interest and sinking-fund charges alone will amount to so much that new loans will likely do no more than cover them. Then, America must be paid by having a large import balance of trade, which would cause important economic readjustments.

Well-informed opinion is that foreign investment is being overdone; money is being invested where safety of principal and interest is not sufficiently assured. More good domestic outlets for capital are wanted. Further large-scale expansion of manufacturing activity is not altogether desirable, for if the present era of great business activity wanes, present productive manufacturing capacity will be more than sufficient. The building industry is already receiving its fair share of capital. No industry is more deserving of greater attention from investors than mining.

The world appears to have no great immediate need of more copper mines than are at present under way. But in five or ten years—and it takes that long and often longer for a prospect to be found and developed to important production—there may well be a real shortage of almost any of the other metals. And the non-metallic field offers vast opportunities, not only in the development of new deposits but in the improvement of present technologic methods.

With a few notable exceptions banking and invest-

ment houses have not accorded mining the attention that it deserves. Doubtless one reason is that the industry has a reputation (not entirely undeserved) for unscrupulous promotion and finance. The fact that the public has been skeptical has prevented many reputable houses from entering the field. No one will deny that there is an element of chance in mining that does not exist to so great an extent in some industries; but, on the other hand, the possibilities of legitimate profit are greater. The opportunity for the banker to finance honest mining enterprise is growing every day. He can show his client that the chances of excellent profit are better than in the purchase of the less conservative foreign municipal and industrial stocks. Every year sees further evolution of mining from the status of a risky gamble to that of an industrial enterprise with more and more of the characteristics of manufacturing—but with the added incentive of larger profits. The investment banker and the capitalist who see the handwriting on the wall will get more of their money than ever before into the exploitation of mineral resources.

Employee Ownership of National Lead Shares

EMPLOYEES of the National Lead Co. certainly have reason to feel that the purchase of shares in the company for which they work is a wise investment. Last year the company bought 15,524 common shares in the open market, which it offered to employees at $140, payable in sixty monthly installments with interest at 5 per cent on deferred payments. The allotment was oversubscribed, as had been two other allotments in 1919 and 1921. Last month a stock dividend was declared whereby shareholders were given for each common share owned, one-half a share of common and one-half a share of new 6 per cent preferred stock. A dividend rate of $5 per share on all the common stock has been established, so that each of the common shares for which $140 was paid is paying $10.50 per annum. The current market price of the common shares is close to $200. Quite evidently the employees who purchased have made a handsome profit already.

The objection that has been advanced to stock ownership by employees is that it is contrary to the principle of diversification of investment. The theory is that if the company should go to the wall, not only would the employee lose his job but likewise his investment. It is to be doubted if many will be greatly impressed with this argument. The benefit derived from knowing something about the industry in which one's funds are invested, as well as about the affairs of the particular company, seems easily to outweigh any remote disadvantage on the other side.

The arrangement is mutually advantageous. Certainly it promotes loyalty and enthusiasm in the interest of the company. Among the large companies that have tried the plan are General Motors and American Telephone & Telegraph. In each instance an initial allotment was followed by others, thereby indicating the success of the scheme.

Not the least interesting angle of the situation is one brought out by E. J. Cornish, president of the National Lead Co., in the last annual report. He says: "Such sales encourage employees to practice self-denial in order to insure their future comfort—in this respect being directly opposite to much of the present-day instalment buying, which pledges future earnings for present gratification." Those who know Mr. Cornish can readily appreciate the sincerity of this remark. So long as he is at the head of the National Lead Co. stock-owning employees need have no great fear either that their shares will become valueless or that they will lose their jobs because of imprudent management of the affairs of the company. It is not such a bad plan to put most of your eggs in one basket—if that basket is selected with sufficient discrimination.

Prospects and Prices

RECENTLY a large operating company purchased a mining prospect for a million dollars. This was an unusual happening, for when the terms of the sale are examined it appears that the owner of the prospect received nothing "down." There was no advance payment, nor was there any provision for periodical payments of fixed amounts. However, the agreement contained the more or less novel provision that payment was to be made out of the proceeds of operation, the owner and the purchaser to divide equally the net proceeds as they accrued. Thus, in effect, a temporary partnership was set up by which the responsibilities for equipment and operation were assumed by the purchaser. It is obvious that such an arrangement implies considerable faith on the part of the seller in the fairness and mining ability of the purchaser. Granting this condition, it would appear that a sale predicated upon payment out of operating profits has much to commend it and in many ways seems more satisfactory than the usual price arrangements.

A prospect is almost impossible to appraise upon any other than a speculative basis. Bargaining upon a lump-sum basis or upon an advance payment and additional future payments sacrifices any hope of added return from successful operations or from the discovery of important orebodies. It is for this reason that owners of prospects often ask prohibitive prices, which results in their property lying idle. On the other hand, the honest purchaser who is interested in the opportunity of developing a profitable mine usually objects to making even moderate "down" payments upon a raw prospect, for it is obvious that he must be prepared to risk a relatively large sum in equipment and initial exploration. If unsuccessful, this capital will, of course, be lost.

Granting sincerity of purpose and experience derived from successful mine operation on the part of the buyer, it is advantageous for owners of prospects to consider seriously a sale based upon payment out of earnings, or preferably in the form of royalties based upon gross production, rather than to sacrifice their property upon the basis of a quick sale at a flat price which may or may not be fair. Some operating organizations would not consider such an agreement, but it is obviously a good one under the limitations stated.

On behalf of the prospector, the "down" payment has the obvious advantage of partially recompensing him for his field work at a time when he probably most needs money. This is highly commendable and it is seldom that the conscientious buyer does not recognize such an obligation and make some provision therefor, even though the major share of payments should come out of earnings.

Low Zinc Prices Hard on the Tri-State District

PRODUCERS OF ZINC in the Tri-State district are making a valiant effort to support the market through a curtailment in production. In the first five months of the current year it has been estimated that the recoverable zinc content of the ore shipped from that district has been 65,000 tons less than in the same period last year, or a cut of perhaps one-third. In this curtailment, however, no support is accorded by the other zinc producers of the country, for the slab-zinc production of the United States as a whole in the first five months of 1927 was 267,707 tons, compared with 271,074 tons in the same period of 1926. It is evident that the other zinc-producing sections of the country not only have failed to curtail, but have actually increased production by almost the same amount as the curtailment in the Tri-State. This is discouraging, no doubt, to the Oklahoma-Kansas-Missouri producers, but it gives emphasis to a trend that is of increasing moment—namely, an increasing proportion of zinc production from complex ores through the use of selective flotation methods.

In complex lead-zinc ores, the zinc content is as likely to be higher than lead as vice versa; nevertheless, perhaps it is more customary to think of the zinc as a by-product rather than the lead. At any rate, the lead and the precious metals commonly associated with it play an important part in the smelter settlement sheet, and so long as lead and silver sell in the neighborhood of present prices, a much lower price for zinc must be reached before many of those operating selective flotation plants are likely to curtail. In fact, the selective flotation process, in its present efficient state, is of so recent development that an increasing amount of complex ore is likely to be so treated for several years to come.

It must not be inferred from this that the Tri-State district is now, or is likely soon to become, any mean factor in the zinc industry. Five years ago, in 1922, which was a representative year, that district produced about 35 per cent of the world's zinc and about 74 per cent of the United States' production. In 1926 these proportions had declined to 31 and 68, respectively. With the recent curtailment, the Tri-State's proportion of the 1927 output is likely to suffer a further marked decline, but it will continue to be an important even if not a governing factor. The disconcerting part is that low zinc prices will not hurt other zinc-producing districts so much as the Tri-State district, and that in a time of low prices it is bound to be the principal sufferer. On the other hand, when zinc prices are high, the district's prosperity is definitely assured for the proportion of lead present is comparatively small.

The World Represented in America

UNITY IS STRENGTH; but pure cement, however good, makes a poor concrete. And so sand and rock and gravel are added, and possibly some agent to secure workability, and another to decrease perviousness. So it is with successful endeavor: Many elements may be needed in the making of a desirable compound.

America's national structure has been built upon the gospel of the open door and co-operation. Opportunity has fostered the genius of Edison and of many other great native-born scientists and inventors, as well as emigrants from foreign lands like Steinmetz and Pupin. America's capacity for recognizing genius without delay or formality has beckoned the prospective leader from afar, and soon he has become assimilated. Some, like Alexander Graham Bell or Franklin Lane, have merely stepped across an imaginary line dividing two friendly nations. The workers of all countries find inspiration and opportunity in the United States, with its unsurpassed educational and research opportunities and high standard of living.

English-speaking literary talent the world over finds remunerative return in contributing to American newspapers and magazines. In mining, especially, composite effort is responsible for continued progress. The *Engineering and Mining Journal* circulates freely abroad, with no less than one-third of its subscribers in foreign countries. This makes for catholicity in editorial viewpoint and results in dependence on foreign co-operation. The English-speaking world is its parish.

By the Way

A FRIEND who operates a mine in New Mexico sends a letter that he received from a foreign manufacturer which ought to stir the envy of the electrical prospecting folks whose modest accomplishments are getting so much attention. We quote in part:

"By the present we have pleasure to send you enclosed our pamphlet, re the 'Radio-Emanator,' an important invention of an up-to-date apparatus for discovering with exactness already from large distances all valuable substance concealed in the earth-ground. This apparatus, which is called on the part of scientific and expert men to be a triumph of the human mind and named by the renowned Doctor Graf to be 'The Miraculous Eye,' permits to search ores of any quality, so as Gold, Silver, Iron, Copper, Tin, Nickel and any other species. Within a few minutes the 'Radio-Emanator' indicates the place and exact direction, where these beds of ore are situated and it gives the limits of these couches under the ground. . . . The manipulation of the apparatus is an easy one and we give exact instructions in English language. . . . The price of the apparatus amounts to $850.—, fob————, including seaworthy packing."

As the Irishman is said to have said, it ought to be cheap at half the price. But even that is doubtful.

MUTUALLY helpful contacts would be established if more mining executives, engineers, and technicians, on their visits to New York City, scheduled their time so as to provide for a brief visit to the offices of *Engineering and Mining Journal*. The editorial latchstring is out, and the establishment from which *E. & M. J.* is weekly sent forth to the four corners of the world holds much of interest. No college contains within its faculty so varied and specialized a technical personnel as is comprised by the many editorial and service staffs of the magazines of the McGraw-Hill family.

A FACETIOUS piece emanating from Mexico appears in "Discussion" this week, wherein a contributor known to us, but who for obvious reasons desires to remain anonymous, relates the havoc that women have played in certain mining camps. Now, among the readers of *E. & M. J.*, we have reason to believe, are many estimable ladies, and we hope to hear from some of them. In fact, there seems no good reason why authorship of even the major articles should be exclusively in the hands of the sterner sex.

Engineers of Note

Alexander Grant McGregor

OVER FIFTEEN YEARS AGO the Miami Copper Co. and the Inspiration Consolidated Copper Co. began the large-scale mine and mill operations in Arizona now so well known in the mining industry. These operations are noteworthy for the number of modern and substantial mining, milling, and smelting plants they include. Developed through the united efforts of mining, mechanical, electrical, metallurgical, and construction engineers, these plants represent advances in engineering practice, and serve as examples for future installations. Noteworthy among the engineers who have greatly contributed to this progress is Alexander Grant McGregor, of Warren, Ariz. McGregor's father, a Scotch minister, came to America when he was twenty-two years of age. His mother was a Pennsylvania school teacher, frugal as any Scotch woman, and ambitious for the education and success of her children. Young McGregor decided to become an engineer, and this was not surprising, as one of his father's brothers was an astronomer in Edinburgh and another was a marine engineer. He became greatly interested in power engineering and devoted all of his spare time to this subject while in college. He graduated from the University of Montana in 1902 and hoped to become a power expert. He went to Anaconda and was fortunate in making friendships with Frederick Crabtree, George Waddell, William Wraith, and Charles Repath, all of whom became interested in the young engineer. Frederick Crabtree wisely urged McGregor to modify his first purpose and to spread his interest into the related fields of mechanical, electrical, metallurgical, and mining engineering. The seven years at Anaconda were in the nature of an apprenticeship that gave McGregor experience in operating details and in investigating mechanical and metallurgical problems. Beginning with 1909, McGregor rapidly assumed greater and greater responsibilities as the years passed. The Tooele plant of the International Smelting Co. was designed in 1909-10. In association with Charles Repath, under the firm name of Repath & McGregor, the Clifton smelting plant of the Arizona Copper Co. was designed; the Douglas smelting plant of the Calumet & Arizona Mining Co. was next designed and its construction directed. During the period 1911-14 the location and preliminary designs of the Inspiration Consolidated Copper Co.'s principal working shafts, crushing plant, storage bins and accessories were made, and a general layout of the United Verde Copper Co.'s smelter was completed. Since 1915 McGregor has been occupied in the location, design, and construction of some of the largest plants in the Southwest, including the International Smelting Co.'s smelter at Miami, the New Cornelia Copper Co.'s leaching plant and works at Ajo, the United Verde Extension Mining Co.'s smelting and mine plant at Jerome, and, in South America, the new Cerro de Pasco smelter in Peru. Gaining the confidence of the late General Greenway and that of Dr. L. D. Ricketts resulted in a close association of McGregor with the enterprises of these two leaders and proved an important factor in his own success. The combination of these three personalities — the vision of the one, the sure judgment, of the second, and the aggressive, clear-headed and experienced engineer—was ideal. The new leaching plant at Inspiration, and the new roaster-reverberatory units at the Copper Queen smelter of the Phelps Dodge Corporation at Douglas, contain noteworthy improvements over previous practice. Both plants are now in successful operation and both are the result of the accumulative experience of McGregor and the technicians associated with him. In a recent interview McGregor said:

ALEXANDER GRANT McGREGOR

"I have been particularly fortunate in being able to keep an able staff of designers with me continuously since coming to Arizona, and I attribute much of my success to the splendid co-operation of C. W. Cromwell, Benjamin Wilson, I. H. Wynne, and H. L. Kohlberg, all of whom have been with me fifteen years or more. We have often advanced a number of different solutions for a problem, but I believe in every such instance we have decided upon a plan which we all judged to be the best. I believe few men gain greater satisfaction from their material accomplishments in life than the engineer."

The scene of much recent prospecting. The Red Lake district, Red Lake in the foreground

Aërial Mapping in Canada

By E. G. Wilson
Special Ottawa Correspondent.

AËRIAL PHOTOGRAPHS are becoming an increasingly important factor in mapping mineral areas in Canada. In the last two or three years remarkable advance has been made in the practical application of aërial photography to surveying, exploration, and map production, and the results obtained show clearly the advantages of this method.

For years the officers of the Canadian Topographical Survey, in common with other survey organizations, had been hampered in their endeavors to map large areas, important from a mineral standpoint, because of the natural difficulties of the country and the consequent huge expenditures involved. In 1922, A. M. Narraway, assistant director and chief aërial surveys engineer of the Topographical Survey, of the Department of the Interior, conceived the idea of plotting maps from aërial photographs. In that year the Royal Canadian Air Force, in conjunction with the Topographical Survey, took thirty-one photographs covering forty-five square miles. The map was plotted, and, on being tested by ground surveys, was found to be accurate to a fraction of 1 per cent. Parliament in the following year appropriated money for a more thorough study of the possibilities of aërial mapping.

Early recognition of the usefulness of the airplane for mapping purposes is found in an account by Mr. Narraway of a personal visit to The Pas mineral area of Manitoba in 1922. Referring to this expedition, he said: "Perhaps the most interesting and useful part of the trip was north from The Pas to the Churchill River and to the camp of our surveyor who was mapping the waterways of the district; the most interesting because of the wonderful views obtained of this country; the most useful because of the experimental photographic work which we were able to do. Flying over the course of the survey, oblique photographs were taken by the K2 camera at intervals of about two minutes. In some of the photographs the survey pickets are clearly discernible and in all of them the prominent land features surveyed can be accurately located. Using the survey of these main features as a control, the details of the shore line and the intricate mass of islands can be filled in from the photographs with accuracy consistent with the requirements. The surveyors were obliged to spend considerable time mapping the shore-line details and islands and even then could only obtain what was confined between the two shores. With the plane, the time required to get in details can be estimated in minutes instead of hours, and, in some cases, days. The scope of the camera widens the survey to several miles, and includes topographical features which otherwise would be left unmapped."

Experiments have long since proved that, in unsurveyed country, where there are no great differences of elevation, given geodetic control, the topographical detail of the whole district may be filled in from aërial pictures with a speed and an accuracy unobtainable otherwise except by most thorough ground surveys.

One of the outstanding features of aërial photography is its wide field of application as an aid in the development of the natural resources of the country. This is indicated by the progress made in the province of Alberta during the last year. In this province, using only one airplane, more than 8,600 square miles of territory were successfully photographed. This area is equivalent to a strip of country ten miles wide extending from Winnipeg to Edmonton. The work consisted principally in obtaining vertical overlapping photographs from an elevation of slightly over two miles. The previous season's experiments showed that, with the photographs available, the mapping work was facilitated so that the examiners could confine their attention almost entirely to the examination and interpretation of the soils and surface cover, thus greatly expediting the work and at the same time obtaining more reliable results. Mr. Narraway estimates that about nine-tenths of the labor and cost have been eliminated from ground work by the adoption of aërial mapping. The success of these operations carried out in conjunction with the ground investigations gives promise of great assistance to geologists.

Another important feature is the general usefulness of these photographs. For instance, a photograph taken during the investigation of the water-power possibilities of a river may show topographical features of the district valuable in map revision. It may also show the nature of the forest cover and, therefore, be of value to the forest services, or the geological features shown may be of interest to the Department of Mines.

In 1926 a total area of over 59,000 square miles was photographed for mapping purposes; this was an increase of 22 per cent over that covered the previous year. About 15 per cent consisted of vertical photography for detail purposes, the remainder being oblique, for general purposes. Over 36,000 square miles of mineralized areas were included in the total area photographed during the year. In all, 152,560 square miles, or approximately 4 per cent of Canada's total area, has to date been photographed either vertically or obliquely.

At present a series of maps of the Red Lake and surrounding districts are being prepared, which will prove of great service to the prospector. One of the maps of the Lac Seul district, on a scale of one inch to four miles, has already been issued. It covers the area from latitude 50 deg. to 51 deg., and longitude 90 deg. to 94 deg., and thus includes Hudson Station and the water route into the Red Lake area. All previous maps have shown only the main water-courses and the larger lakes; this one shows literally thousands of lakes, ponds, and islands.

Mapping with airplanes is admirably suitable for exploring parts of the dominion that are heavily covered by bush and crowded with lakes and streams. Before the invention of the airplane, it had been considered impossible even to attempt to map these areas, notwithstanding the fact that the bulk of the country's resources are to be found therein. Aërial mapping can be very helpful in mineralized districts, such as northwestern Quebec, but only in conjunction with work on the ground. Mapping by means of photographs made from an airplane greatly facilitates but does not displace ground work in such districts.

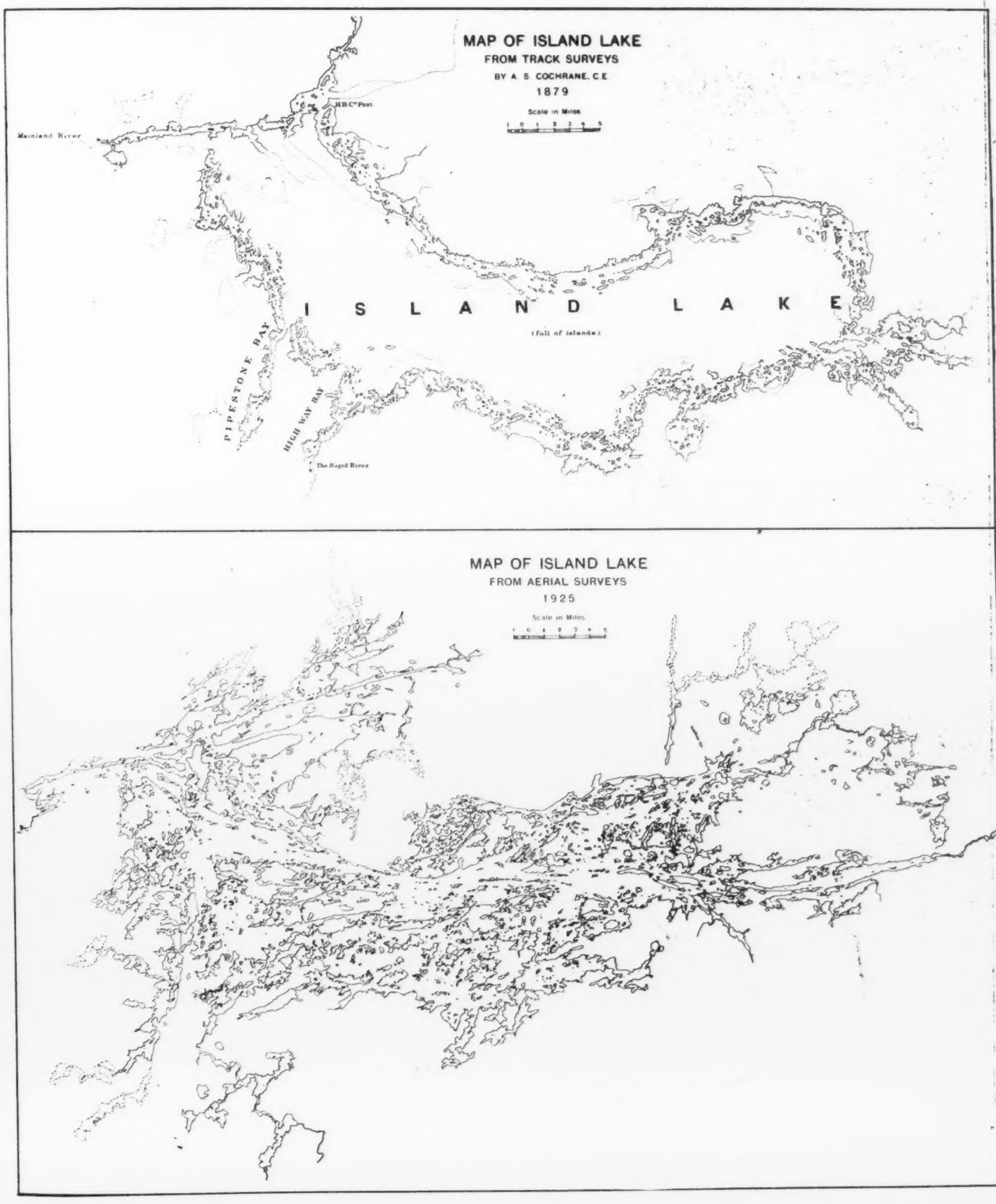
The principal value of aërial mapping in mineral areas is that the maps show the prospector the way to get round the country, thus saving a great deal of time.

Herb Lake, in the center of mining activity in northern Manitoba

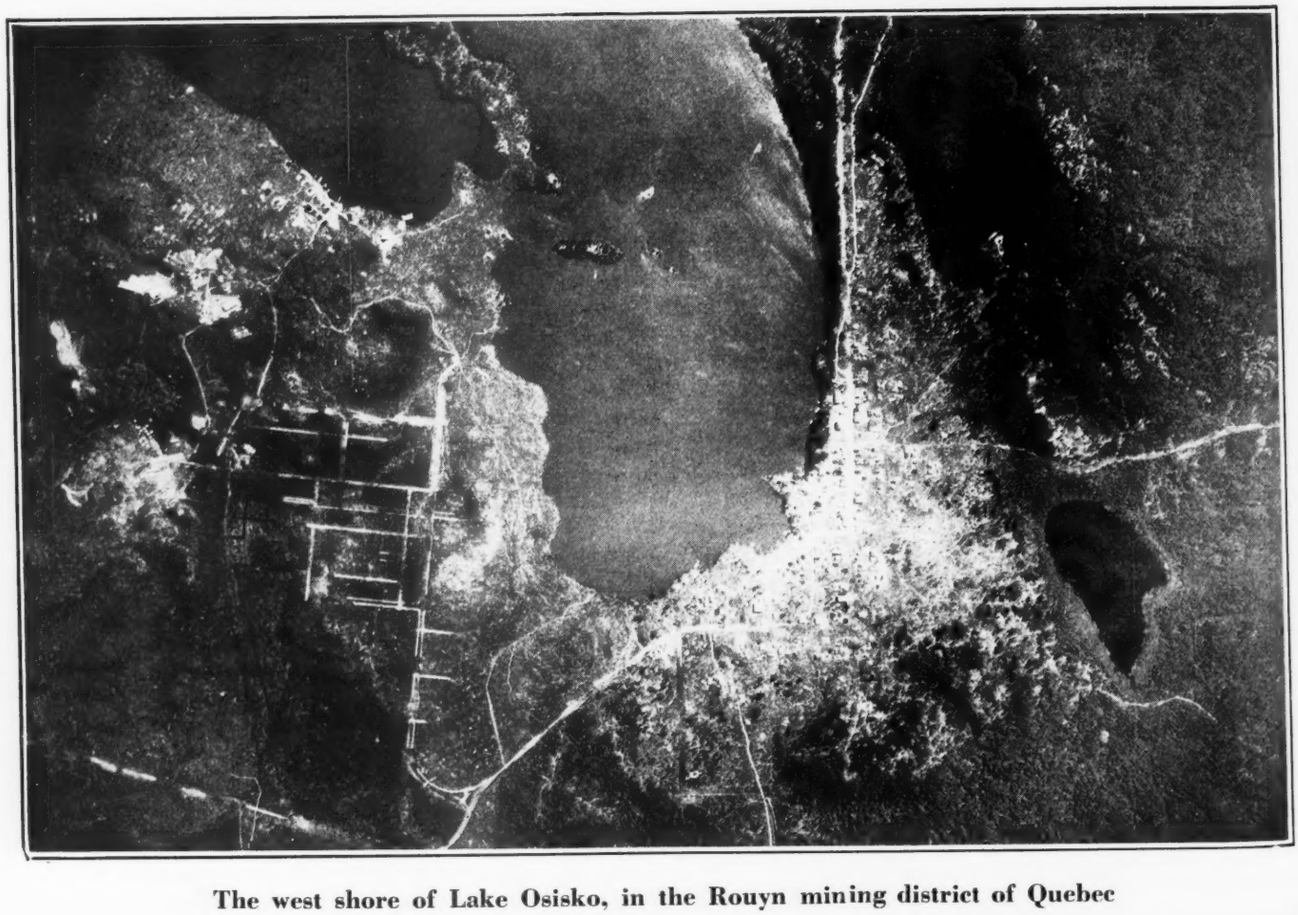
The maps are also of inestimable value to the prospector in recording his claims, as truthfulness of outline and completeness of detail leave no uncertainty as to location. At the time of the Red Lake gold rush two years ago the Topographical Survey made a survey of the district, thus enabling prospectors to register their claims accurately without loss of time. Before this service was available many errors in registered claims occurred.

There are some sections of the country where it would be almost a physical impossibility to map by land surveys. A good illustration is furnished by the work carried out at Island Lake, on the Manitoba-Ontario boundry, northeast of Lake Winnipeg. This lake, shown in the accompanying map plate, is 65 miles long and is dotted with thousands of small islands. It was estimated that it would take a survey party more than five years to complete the work. The lake was photographed last summer in complete detail in two and one-half hours and was plotted in less than one week. The total cost was approximately $500.

Practically all of the 1926 oblique aërial photographic



Amos, Quebec, on the Harricanaw River, in the Abitibi mining district



The west shore of Lake Osisko, in the Rouyn mining district of Quebec

work was done with "flying boats" operating from the Winnipeg air base or sub-bases in that district. From the photographs obtained seven map sheets are now being prepared. These sheets cover areas each approximately 94 miles in length by 70 miles in width.

The area covered by the Trout Lake, Sioux Lookout, and Lake St. Joseph sheets is at present attracting considerable attention owing to its promising mineral possibilities, and these sheets, which will soon be available, should assist greatly in its development. The Lac Seul, Pointe du Bois, Carroll Lake, and Red Lake map sheets were issued during 1926.

Vertical aërial photographic operations covering areas of over 3,000 square miles were carried out in Alberta from the High River base last year. Also, from the Ottawa air base vertical aërial photographs were taken over areas in Ontario and Quebec aggregating about 6,000 square miles, the largest area photographed being about 5,650 square miles in the vicinity of the Rouyn mining district. The work in the district will be continued this summer, principally in the Munro and Abitibi areas, located near the Ontario boundry.

On March 31, 1927, over 100,000 prints of aërial photographs taken by the Royal Canadian Air Force had been recorded, indexed, and filed by the Topographical Survey.

*Application of Aërial Photography to Standard Topographic Mapping by the U. S. Geological Survey**

By J. H. Wheat

Chief of the Section of Photographic Mapping, Topographic Branch, U. S. Geological Survey

THE EXTENT to which the U. S. Geological Survey is making use of aërial photography is indicated by the successful operation of a photographic mapping section in the topographic branch of the Survey which was formed in February, 1921, and which since that date has compiled base maps on the standard map scale covering an area of more than 20,000 square miles.

Plotting Method Used

Among the duties of the photographic mapping section is the compilation of aërial photographic data adjusted to primary control. Control points from previous ground work are plotted on a carefully constructed projection, and the utmost care is taken in the compilation and adjustment of the photographic data, which is done by the radial-line or intersection method, using the principal point—or optical center if it can be recovered—of each photograph and drawing straight lines from it through points in common on at least three overlapping photographs, the drafting being done on a tracing of the projection and control points superimposed on the photographs. Overlapping tri-lens photographs, each photograph overlapping the next one by at least 60 per cent, with an overlap of adjoining flights of 30 per cent, are used to secure intersections. Each set of prints of a flight is started from control points independently of its neighbor. The accuracy of intersections in common between adjoining flights is revealed immediately as the graphical adjustment progresses, just as intersections are checked in plane table triangulation. The orientation of each tri-lens photograph and the location of its center on the tracing is accomplished in the same manner as the instrument position is obtained in the field by a three-point location on the plane table, when using the tracing paper method.

After securing a sufficient number of intersections to insure the correct position of details interpreted on the photographs, each photograph is placed in position under the tracing cloth and the features desired are traced and inked, resulting in a base map carrying roads, houses, railroads, drainage, wooded and swamp areas—in fact, all except relief features—accurately located. The original tracing on the scale of the photographs is reduced to the field scale, and light blue photolithographic prints on double-mounted drawing paper are furnished the topographer for field use, thus enabling him to devote most of his time to mapping the relief of the terrain.

This method is employed in the regular program of topographic mapping carried on by the U. S. Geological Survey wherever aërial photographs are available. It results in a more accurate delineation of meandering streams; the location and outline of isolated lakes and ponds in wooded areas, as well as clearings in such areas; the details of swamp and marsh areas inaccessible by ground methods, particularly those along the coast lines; and shortens the time necessary to complete field work, which in turn reduces the cost of making the map. The Air Corps of the Army co-operates with the Geological Survey by photographing areas desired. This co-operation is comparable to that between the Royal Canadian Air Force and the Topographical Survey of Canada.

Value of Photographic Data

The Geological Survey has not attempted to use aërial photographs stereoscopically in the delineation of contours by photographic methods alone, but it has cooperated with one commercial agency in experimental work and is arranging through co-operation with another agency a demonstration by a different process. The officials of the Geological Survey believe that there are great possibilities in the use of aërial photos, but are convinced that technical development will require considerable more ground-control work and more detailed office preparation of the results. The Geological Survey plans to take advantage of all new developments in this field wherever these developments demonstrate that time and money will be saved.

Of the many uses made of the standard topographic map none are of greater importance than their use in surveys made to determine the mineral resources of the country; in the investigation of mines and mining properties; and in the study of various geologic problems having an economic phase.

*Published with permission of the Director, U. S. Geological Survey.

Keeping in Touch with Headquarters by Radio

By Cooper Shapley

Consulting Mining and Metallurgical Engineer, Bishop, Calif.

LAST WINTER it was necessary for me to leave headquarters to make trips into New Mexico and Arizona, and, knowing something about what the amateur radio stations were doing, I tried the experiment of keeping in touch with my home in Bishop, Calif., by using 40-meter low-power transmission. The results of this experiment proved to me that such communication is practical and that within a range of 1,000 miles any mine can keep in touch with the home office.

The plan has some disadvantages: a telegraphic code is used and a time schedule must be arranged. The low cost of the equipment, however, is an outstanding advantage; the two necessary sending and receiving sets cost about $150 each.

On my recent trip into Arizona I arranged to receive a report from home every evening at 7 o'clock. While in Tucson, the University of Arizona allowed me to use its station, which is equipped for 40-meter work. There I received messages from my home, 900 miles away. At some places I would look up an amateur in the "Call Book," which contains the names and addresses of over 17,000 amateur radio operators in the United States, and obtain permission from him to keep my schedule through his station.

The wave-length used is so far below that used by the broadcasting stations that there is no interference. Also, the selectivity of the 40-meter receiver is so sharp that hundreds of stations can be tuned in within an arc of twenty-five degrees. The operating power used is obtained from one 6-volt storage battery and several 45-volt B batteries.

As an example of the application of this short-wave radio, let us assume that a mine is located in the "wilds" of Nevada and has headquarters in San Francisco. A transmitter and receiver are installed at the mine, and arrangements are made by mail with some amateur in the city to handle messages. He will listen for you at the prearranged time, take your messages, telephone them to anyone in the city to whom you wish them to go, send their reply back to you; all this within a few minutes.

No Substitute for Manganese in Steel

In the manufacture of steel, no satisfactory substitute for manganese is known, declares the U. S. Bureau of Mines. In Germany during 1917 and 1918 the shortage of manganese necessitated trial of many substitutes, such as aluminum in the form of silicon-aluminum alloys. Aluminum has a greater affinity for oxygen than manganese, but the oxidization of aluminum produces alumina, which is relatively infusible and often remains in the steel as slag inclusions. Aluminum cannot eliminate sulphur or change the condition of sulphur as manganese can. A slight excess of aluminum tends to produce large pipes in the ingots. Silicon in the form of ferrosilicon probably has a greater affinity for oxygen than manganese, but its use is attended by the following disadvantages: In slight excess it causes large pipes to form in ingots: the products of oxidation remain in the steel; it has no effect upon sulphur and no effect on the molecular arrangement of the metal. Ferrotitanium is the most powerful deoxidizer known. Titanium does not alloy freely with iron and imparts to steel qualities that are not acceptable to the trade. Calcium, sodium, vanadium, and boron alloys have been tried as deoxidizers, but homogeneous steel was not produced when they were used.

Palladium—A New Metal for Jewelry

Thirty years ago the position of gold as the preferred metal for jewelry seemed unassailable, and in this position it was buttressed by tradition, intrinsic beauty, and price, says the *Industrial Bulletin* of Arthur D. Little, Inc., for June. Fashion, however, for reasons of its own, has since then turned to platinum, with the result that the price of the latter metal was soon several times that of gold, to the great disadvantage of chemical science and industry, in which platinum is essential for many purposes. The demand for white jewelry and the great increase in the cost of platinum then led to the development of so-called "white gold" by alloying gold with base metals.

Curiously enough, there was a much more suitable material available in the metal palladium, of the so-called "platinum group." Palladium is untarnishable and has the same blue-white color as platinum itself. It now seems likely to come into its rightful place as a material for jewelry. Many people have a prejudice against white gold, regarding it as imitation platinum, and, moreover, all white gold slowly tarnishes. Though other people buy white gold, many wish for something better, yet cannot afford platinum.

Palladium Much Lighter Than Platinum

Palladium fits itself into its intermediate position because, with platinum at $110[1] an ounce, palladium sells at $72[1] and 18K white gold at $18, but the specific gravity of platinum is 21.4, whereas that of palladium is only 12.16, or little more than half. If, therefore, twenty articles be made from one ounce of platinum, thirty-five identical pieces can be produced from an equal weight of palladium. At the prices given above, if the metal value of a piece of jewelry is $100 in platinum, it will be $36 in palladium and $11 in 18K white gold.

Pure palladium, in common with pure platinum, is too soft for practical jewelry manufacture, but the problem of finding alloying metals that will impart to it the necessary hardness and stiffness, while leaving its color unaltered and its working qualities unimpaired, has now been solved by the addition of about 5 per cent of platinum and 3 per cent of the rare metal, ruthenium. Palladium, thus alloyed, is not only beautiful in itself, but is not contaminated with base metals; it wears well and cannot tarnish.

Palladium also has the advantage of some tradition of its own, for it derives its name from Pallas Athena, the patron goddess of classic Athens, and always identified with the idea of protection. As used by jewelers today, it is indistinguishable from platinum in appearance.

[1]These were fine prices while they lasted. Platinum, in the last two months, declined to below $70 and palladium to about $55.—THE EDITOR.

Pegmatite Mining in the Black Hills

By Francis Church Lincoln
South Dakota School of Mines, Rapid City, South Dakota

Francis Church Lincoln

THE Black Hills of South Dakota are situated in the southwestern part of the state on the Wyoming border. They form a mountain range higher than the Appalachians, extending for 125 miles north-northwesterly and south-southeasterly and having a width of 60 miles. This range attains its greatest elevation in its southern portion, where Harney Peak reaches an altitude of 7,242 ft. above sea level, making it the highest mountain in the United States east of the Rocky Mountains. Pegmatite mining in the Black Hills has been conducted mainly in the district surrounding Harney Peak, and particularly in the neighborhood of the towns of Keystone, 5 miles northeast of the peak; Hill City, 5 miles northwest; Custer, 7½ miles southwest; and Pringle, 18 miles to the south-southwest. Pegmatite mining has also been carried on to a minor extent at Tinton, in the Nigger Hill district of the northwestern Black Hills.

The range has been carved from a domical uplift and has at its center an oval core of pre-Cambrian crystalline rocks from which concentric rings of Cambrian and later sedimentary rocks dip away on all sides. The crystalline core is exposed over an area of 60 miles in length by 25 miles in width. It has been intruded by granites and pegmatites of Pre-Cambrian age and by Tertiary porphyries. The largest granite intrusion is at Harney Peak, in the southern Black Hills, and is of irregular shape, with an average diameter of about 10 miles. It consists largely of coarse granite ranging into pegmatite; and the schist about it contains numerous pegmatite dikes, some of which have been worked. At Nigger Hill, the other locality in which pegmatite has been mined, the geology is more complicated. There the Pre-Cambrian schist with its pegmatite dikes was intruded by a laccolite during Tertiary time, and erosion has exposed Pre-Cambrian islands in a sea of Tertiary porphyry.

Table I—Primary Minerals of the Black Hills Pegmatites
(The italicized minerals have been exploited commercially)

Albite	Molybdenite
Almandite	Monazite
Amblygonite	*Muscovite*
Andalusite	Oligoclase
Anorthoclase	*Orthoclase*
Apatite	Petalite
Arsenopyrite	Pyrite
Autunite	Pyrrhotite
Barite	*Quartz*
Beryl	Rutile
Biotite	*Scheelite*
Bismuth	Schorlomite
Bismuthinite	Sericite
Calcite	Siderite
Cassiterite	Silver (By assay)
Chalcocite	Spessartite
Chalcopyrite	Spinel
Columbite	*Spodumene*
Corundum	Stannite
Epidote	Stibnite
Fluorite	Struverite
Galena	Sylvanite
Gold (By assay)	*Tantalite*
Graphite	Tapiolite
Graphite	Tetradymite
Grossularite	Titanite
Hübnerite	Torbernite
Ilmenite	Tourmaline
Lepidolite	*Triphylite*
Leucopyrite	Triplite
Lithiophilite	Uraninite
Magnetite	*Wolframite*
Microcline	Zircon

The pegmatites of the Black Hills are of scientific interest because of the light they throw upon the origin and history of pegmatites; because of the numerous and rare species of minerals which they contain; and because of the immense size of some of the crystals and mineral masses occurring in them. Their bearing on the theory of pegmatites has recently been discussed in these pages,[1] and will not be taken up in the present article.

[1] Hess, F. L.: "The Natural History of the Pegmatities," Vol. 120 (1925), pp. 289-298.

Table II—Mineral Production from Black Hills Pegmatites

Year	Andalusite		Beryl		Columbite		Feldspar		Lithia Minerals		Mica	Rose Quartz	Tin		Tungsten	
	Tons	Value	Tons	Value	Lb.	Value	Tons	Value	Tons	Value	Value	Value	Tons In Conc.	Value	Tons of Conc.	Value
1879–1901	.....	.....	.....	.....	.....	.....	.....	.....	1,600	$40,000 (c)	$600,000 (c)	$3,150(g)	25	$10,000(c)	.....	.....
1902–1912	.....	.....	.....	.....	.....	.....	.....	.....	3,800	123,500 (f)	547,400 (d)	20,611	44	27,660 (g)	.....	.....
1913	.....	.....	.....	.....	.....	.....	.....	.....	500	19,500 (a)	12,609 (b)	162	1	660 (b)	8	$3,000 (f)
1914	.....	.....	6	$538 (a)	.....	.....	.....	.....	46	1,150	7,504	404	.....	.....	1	400
1915	.....	.....	.....	.....	.....	.....	.....	.....	256	5,120	10,914	350	.....	.....	1	1,425
1916	.....	.....	.....	.....	.....	.....	.....	.....	549	10,970 (b)	59,770	467	.....	.....	7	12,000
1917	.....	.....	.....	.....	.....	.....	.....	.....	1,281	25,620 (a)	11,008	}	10	12,300	1	1,000
1918	.....	.....	3	270	4,500	$2,250 (b)	.....	.....	1,755	37,100 (b)	10,464 (a)	} 1,400	.....	200	2	2,000
1919	.....	.....	3	180	300	90	.....	.....	1,727	46,600	5,245	}	6	.....	.....	.....
1920	.....	.....	.....	.....	4,000	1,450	.....	.....	550	33,000 (h)	3,875 (h)	}	.....	6,000	.....	.....
1921	.....	.....	1	50	3,400	1,150	.....	.....	670	23,450	2,290 (b)	335	.....	.....	.....	.....
1922	.....	.....	4	200	600	240	.....	.....	588	20,640	4,980 (h)	}	.....	.....	.....	.....
1923	.....	.....	7	350	1,350	540	150 (a)	$3,000	1,052	39,125 (a)	6,480 (b)	}	.....	.....	.....	.....
1924	4	$235	.....	.....	1,197	598	1,800	7,200	1,331	53,833	10,000 (f)	} 1,750	.....	.....	.....	.....
1925	16	635	.....	.....	.....	.....	2,000	8,000	1,017	40,800	10,500	}	.....	.....	.....	.....
1926	.....	.....	25	875 (f)	2,000	800 (f)	4,500 (e)	27,000	883 (e)	35,320	21,500	}	.....	.....	.....	.....
Total....	20	$870	49	$2,463	17,347	$7,118	8,450	$45,200	17,604	$555,728	$1,324,539	$28,629	86	$56,820	20	$19,825

Grand total..... $2,040,322

(a) Annual reports of the State Mine Inspector of South Dakota. (b) "Mineral Resources." (c) O'Harra, C. C.: "Mineral Wealth of the Black Hills." S. D. School of Mines Bull. 2 (1902). (d) Ziegler, V.: "The Mineral Resources of the Harney Peak Pegmatites." *Mining & Scientific Press*, Vol. 108 (1914), p. 660. (e) Rapid City *Daily Journal*. (f) Estimated. (g) Estimate based on "Mineral Resources." (h) Estimate based on annual reports of State Mine Inspector.

In the Black Hills. Mount Rushmore, the pegmatite peak from which Gutzon Borglum expects to carve a national monument

Sixty-six primary minerals have been recognized in the Black Hills pegmatites, as shown in Table I. Several of these species occur in a number of distinct varieties. Many of the primary minerals are rare, and a number of rare minerals also occur among the secondary minerals found in the pegmatites. The largest spodumene crystals in the world are found in the Black Hills pegmatites, and what is probably the largest beryl crystal and the greatest mass of columbite have come from them, and many other minerals occur in them in gigantic crystals or immense masses.

Seventeen of the minerals listed in Table I have been mined and shipped from the pegmatites of this region. That these shipments have been of considerable commercial importance may be seen from Table II. Andalusite, beryl, columbite, feldspar, lithia minerals, mica, rose quartz, tin, and tungsten have all contributed to make up a total of more than $2,000,000 in value, which has been produced from the pegmatites in the last forty-eight years. Value alone does not fully express the economic importance of this production. The only columbite mined in the United States has come from these dikes; they have been the principal, and for many years the only, source of rose quartz in the country; and they were for a time the chief source of lithia minerals in the world. The pegmatite mines produced $85,170 in 1926, which was the largest annual production attributed to them since 1911, and indicates a healthy revival of pegmatite mining.

Muscovite mica was the first pegmatite mineral to be mined in the Black Hills, and has contributed more to the value of the total production than all the other economic minerals of the pegmatites put together. It was first exploited at the Crown mica mine, near Custer, in 1879. Soon thereafter, the New York, Lost Bonanza, Climax, and a number of smaller mica mines were opened in the Custer district; about the same time a few small mica mines, including the Peerless, began operations in the Keystone district. Up to July 1, 1884, the total production of sheet mica amounted to 124,640 lb. valued at $442,589.[2] Subsequent to 1884, the production declined as a result of competition with cheap Indian mica, remaining low until 1907.

In 1906, the Westinghouse Electric & Manufacturing Co. reopened the New York, White Spar, and Crown mica mines, in the Custer district, and began intensive operations, which resulted in placing South Dakota second only to North Carolina as a mica-producing state, with annual productions averaging $100,000 in value from 1907 to 1911 inclusive. The New York was the largest of the Westinghouse mines. Mica mined on this property was ordinarily from 2 to 8 in. in diameter and 1 to 5 in. thick, although books up to a yard in diameter have been found.[3] This mica occurs in a dike 40 ft. wide and dipping 50 deg. This dike is richest in mica near its walls, where for a width of 3 or 4 ft. the mica constitutes from 6 to 7 per cent of the dike matter. The mine is developed to a depth of 300 ft. by means of a vertical shaft cutting the dike between the 100 and 200 levels and crosscuts to the dike at the 100, 200, and 300 levels. Overhand stopes 6 ft. wide were carried upward on the mica shoots both on the foot and on the hanging wall of the dike. The ground stood well, requiring only an occasional stull as timbering. Holes about 7 ft. deep were drilled and loaded lightly to minimize the injury to mica books when blasting. Mica and waste were sorted underground, and most of the waste was used as filling, a small portion only having to be hoisted. Separate chutes were provided in the stopes for the mica, and the cars of mica on arrival at the surface were trammed to a trimming and grinding house. The White Spar and Crown mines were each developed by means of 100-ft. shafts.[4] The Westinghouse mines were shut down in 1911, and mica mining in the Black Hills suffered

[2]"Mineral Resources," 1883-84, p. 910.

[3]Sterrett, D. B.: "Mica Deposits of the United States," U. S. Geological Survey, Bull. 740 (1923), p. 293.

[4]Simmons, J.: "Mica in the Black Hills of South Dakota," *Mining World*, Vol. 33 (1910), pp. 221-23.

Model of head of Washington which Gutzon Borglum proposes to carve from the pegmatite of Mount Rushmore

another long period of depression, from which it is only just recovering. The recent improvement in the mica industry is to be credited mainly to the tariff imposed by the McCumber-Fordney Act of 1922.

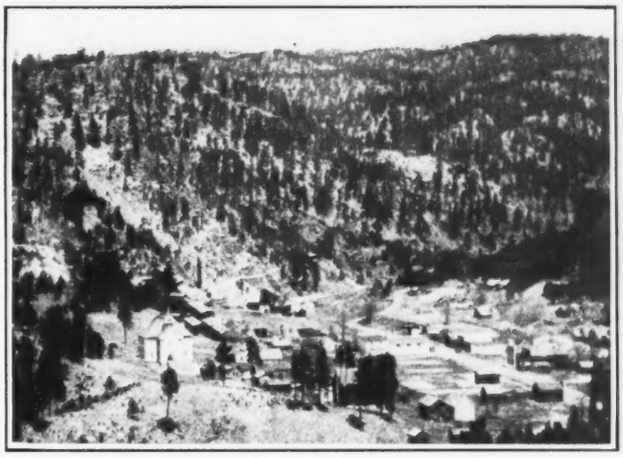
The first scrap mica was shipped from the Black Hills in 1900, and scrap mica contributed in a minor degree to the Westinghouse production, but of recent years the major value of the mica shipped has lain in the scrap. The principal mica producer of 1926 was the Peerless mine of the Keystone Feldspar & Chemical Co., which was one of the first mines to be opened in the Keystone district. This production was entirely scrap mica, and with slight additions from the neighboring Hugo mine, belonging to the same company, totaled 925 tons. Small amounts of both sheet and scrap mica were produced in 1926 by W. D. Wood from the Old Mike mine, in the Custer district, and by the Dakota Feldspar Co., of Rapid City, from its mine near Pringle. The Peerless and the Hugo are open-cut mines; the Old Mike and Dakota are developed by tunnels.

Tin Discovery Causes Boom

The presence of stream tin was recognized in the gold placers of the northern Black Hills as early as 1876, and in those of the southern hills in 1877; but Black Hills tin aroused no special interest until it was discovered as cassiterite in place at the Etta mica prospect, near Keystone, in 1883, and soon afterward at Tinton, in the northern hills. Tin deposits of commercial value were lacking in the United States, and these discoveries created great excitement and culminated in the great Black Hills tin boom. Numerous tin-mining companies were formed, and most of those in the Harney Peak region were consolidated with the Harney Peak Mining, Milling & Manufacturing Co. This company expended large amounts of English and American capital extravagantly and finally went into the hands of a receiver in 1894. The amount of metallic tin which the company produced is said to have been less than five tons, which was far less than the weight of the gold coin it expended.[5] Since then there have been a number of sporadic attempts to mine tin in the Black Hills, which, although fortunately involving smaller expenditures, have met with scarcely better success. One failure, with its amusing side for those not directly interested, resulted when the Hill City Tungsten Producers Co. mined and milled a pegmatite containing columbite under the impression that the heavy mineral was cassiterite.[6] Although some tin concentrates have been produced from the pegmatite dikes of the Hill City and Nigger Hill districts, and some stream tin has been marketed from the placers derived from these pegmatites, the total production of metallic tin which can be credited to the Black Hills is less than 100 tons. The only tin-mining company at present active is the Black Hills Tin Co. at Tinton, in the Nigger Hill district, of which John Bland is manager. This company is remodeling its mill and is preparing to mine 1,000 tons a day from an open cut, sending one-third of this amount to this new 250-ton mill, where it will be further sorted by hand before treatment. The company also owns a mica-separating machine with which it proposes to produce mica as a byproduct.

Dr. W. P. Jenney brought a specimen of rose quartz back with him on his return from his first expedition to the Black Hills in 1875; and the mineral has been commercially exploited since 1889. Some of the most beautiful rose quartz in the world has come from the Black Hills, and has been shipped all over the United States and to many foreign countries for use in jewelry and as a decorative stone. There are a number of small producers, but the principal mine is the Red Rose situated 6½ miles southeast of Custer and belonging to Mrs. Samuel Scott. At this mine the pegmatite dike contains a mass of quartz 6 to 15 ft. thick, 10 to 30 ft. high and more than 100 yd. long. The quartz varies in color from white to pink and deep rose. Mining and preparation are simple, the quartz being blasted from the face of the ledge and sorted by hand.[7] It is interesting to note that Mrs. Scott makes annual shipments from this mine to China.

Four substances in the Black Hills pegmatites have been mined for their lithia contents: spodumene, a lithium-aluminum silicate; amblygonite, a lithium-aluminum-fluorine phosphate; lepidolite, a complex silicate containing about 4 per cent of lithium; and lithiophilite-triphylite, a natural mixture of lithiophilite, a phosphate of manganese and lithium, with triphylite, a phosphate of iron and lithium. Attention was first called to the possible use of Black Hills spodumene as a source of lithia by Dean McGillicuddy of the South Dakota State School of Mines in 1895. A trial shipment was made from the Etta mine, in the Keystone district, in 1895, and during the next few years shipments were made from the Etta and other mines in the Keystone district and the Palmer Gulch mine, in the Hill City district. South Dakota became the greatest lithia producer in the United States, a position which it maintained until 1918, when outstripped by California. A little lithiophilite-triphylite was shipped from the Keystone district and from the neighborhood of Bismuth, south of Keystone, during the early days of lithia mining, but most of this material mined still remains on the various dumps for lack of market. Amblygonite deposits were later developed and were first mined in 1905. Owing to the higher lithium content of amblygonite, it was mined in preference to spodumene for a number of years, but with the partial exhaustion of the amblygonite deposit, spodumene has again become



Keystone, in the Black Hills of South Dakota

[5]Hess, F. L.: "Tin, Tantalum, and Tungsten Deposits of South Dakota," U. S. Geological Survey, Bull. 380 (1909), p. 135.

[6]"Mineral Resources" for 1918. Vol. 1, p. 24.

[7]"Mineral Resources" for 1908, Vol. 2, pp. 836-37.

the principal lithia mineral mined. Within recent years a small amount of lepidolite has been produced annually. The lithia minerals have been the chief commercial minerals of the pegmatites from 1917 to the present.

Tungsten mining on the pegmatite dikes and related quartz veins of the southern Black Hills was conducted from 1913 to 1918, with a production of about 20 tons of tungsten concentrates, valued at about $20,000. No tungsten mining is in progress in the southern hills at present. The main tungsten production of the Black Hills has come from the non-pegmatitic lodes of the northern section, which have produced a million dollars' worth of tungsten and are now being exploited by the Homestake Mining Co.

Interesting Byproducts

Beryl, columbite, and andalusite have been produced in the Black Hills mainly as byproducts of mining operations conducted for other economic minerals. Beryl has been shipped intermittently since 1914, the demand being slight and irregular. The columbite of the Black Hills pegmatites ranges in composition from nearly pure columbite, a columbate of iron and manganese, to pure tantalite, a tantalate of iron and manganese; and should be designated as columbite-tantalite. Shipments of this rare mineral were made from 1918 to 1924 by Dr. A. T. Roos, of Rapid City, who collected his material from various pegmatite mines. The columbite-tantalite shipped by Doctor Roos averaged 50-53 per cent Ta_2O_5 and 20-22 per cent Cb_2O_5 and was used for experimental purposes in ferro-tantalum-columbium without separation of the two rare metals. In 1926 one ton of columbite-tantalite was shipped from the Peerless mine to the Fansteel Products Co., at North Chicago, for use in the manufacture of radio and vacuum tubes. A small shipment of andalusite was made by the Black Hills Mining Co. from its property near Oreville between Hill City and Custer in 1924, and in 1925 there were two other small shippers of this mineral in addition. It was used in the manufacture of artificial sillimanite for use in high-grade spark plugs, and proved entirely satisfactory for this purpose. Shipments ceased, however, as the mineral was not sufficiently developed to permit of making large contracts.

Favorable Freight Rates Assist District's Development

Feldspar mining in the Black Hills owes its inception to favorable freight rates obtained in 1923. The first shipments were made in that year, and the annual production increased rapidly from 150 tons then to 4,500 tons last year. The Keystone Feldspar & Chemical Co. is the only producer at present. This company obtains its main supply from the Hugo mine and a minor amount from the Peerless mine. These mines are both worked by open-cut methods and produce high-grade potash feldspar. Should the bill now before Congress proposing a $3 import duty on raw Canadian feldspar become a law, feldspar mining in the Black Hills would receive a great impetus.

A new use for the pegmatites of the Black Hills has been suggested by Gutzon Borglum, the sculptor, who proposes to carve a national monument from the pegmatite of Rushmore Mountain, near Keystone. The carving will be accomplished by channeling with rock drills, no powder being employed for fear of injury to the stone. Machinery is now being collected in Keystone for use on this project, and the first figure to be carved will be that of George Washington. The large scale of this sculpture may be realized when it is known that the head of Washington will be about 60 ft. in height.

Mining Work Active in Portland Canal District of British Columbia

A tone of optimism prevails in the Portland Canal district of British Columbia in consequence of mining developments carried on during the past year, says Dr. George Hanson, of the Canadian Geological Survey. The Salmon River part of the district, brought to the fore by the Premier mine, has become still more attractive through the efforts of the British Columbia Silver Corporation on its property adjoining the Premier and by development by the Big Missouri Mining Co. of new finds which have been made on the Big Missouri group of mineral claims.

Owing to increased mining activity, the Premier Gold Mining Co. has maintained substantial dividends, although mining a much lower grade of ore than previously. Shipments of ore from the Premier mine during 1926 were at the same rate as those of the previous year, but the company's milling capacity was increased considerably, and it has also secured option on several other properties in the district.

The British Columbia Silver Corporation is now in the more advantageous position of having definite information regarding the location and peculiarities of its ore deposit, and its management is convinced that it has a property of considerable value. Some of the ore is good enough to pay the cost of expensive transportation and still yield a large profit, but most of it will have to be concentrated before shipment. New finds on the Big Missouri are more attractive than those known heretofore.

The Bear River part of the district has no new orebodies, but new ground has been prospected with very encouraging results. Dunwell Mines, Ltd., began the operation of a mill having a daily capacity of 100 tons, constructed during 1926. Three products are obtained —argentiferous galena, argentiferous zinc-blende, and auriferous pyrite. Extensive development under the management of the Consolidated Mining & Smelting Company of Canada is also expected in the summer of 1927 on a copper-gold property located in this district.

The Porter-Idaho Mining Co., Ltd., continued small shipments started three years ago from its property in the Marmot River part of the district. During the last year 175 tons of ore was shipped, but the grade (425 oz. silver and 35 per cent lead) was much better than that of the shipments of previous years. This ore came from newly discovered veins which proved to be the continuations of those previously developed. Another property in this section, known as the Harner group, was discovered and developed by open cuts during the summer of 1926 and is likely to produce ore in another year or so.

Marmot River is a relatively new field and gives promise of greater activity. The properties are much nearer tidewater than those of Salmon River and most of those of Bear River, but trails are so far the only means of access. A wagon road is now under construction, and although only two and a half miles long will be of considerable benefit to shippers.

The Jaw Crusher as a Secondary Breaker

By W. T. W. Miller

Engineer in Charge of Crushing Machinery Department,
Hadfields Limited, Sheffield, England

STRENUOUS EFFORTS have been made during a number of years to find a single crusher which would reduce the material from large lumps to a fine product in one operation. Such a machine would simplify the plant layout and minimize the cost for subsidiary parts, but hard experience has taught that it is more economical to break the rock in stages, and the tendency of modern practice is to increase the number of operations and limit the extent of reduction at each step in the series.

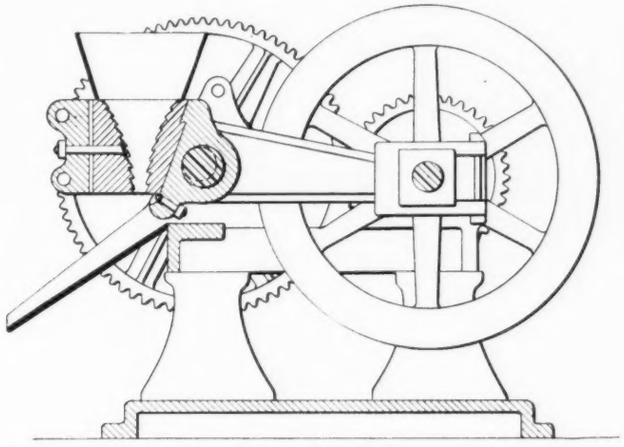


Fig. 1—The Goodmans fine crusher, in service prior to 1875. An early example of a machine with a roll-jaw movement

The engineer who is designing the flow sheet for a crushing plant must be in a position to discriminate between the merits of the various machines which may be used at each step in the reduction process, and a knowledge of their limitations is essential. Careful records have proved that, in reciprocating breakers such as jaw and gyratory crushers, it is not advisable to reduce more than 6 to 1 on hard rock or 8 to 1 on the softer stones.

Generally speaking, the jaw crusher is not so useful as the gyratory as a secondary breaker, because of its low capacity when set for fine crushing, but there are occasions when it will show advantages over its rival, and the jaw breaker should certainly be considered when the output required is small.

The Blake-type jaw crusher depends on gravity to supply the force necessary to move the material downward toward the exit opening in the intervals between the crushing strokes. Free fall is hindered by friction—the friction of the material against jaw and cheek plates and the friction of contact particle against particle. It is natural that the friction should increase as the orifice decreases, and Blake crushers have a tendency to clog when set for very fine product.

Many attempts have been made to assist the force of gravity by mechanical means. Crushing rolls, when made large enough in diameter, will grip the stones and drag them downward during the crushing process, and the early designers endeavored to embody the same feature in the jaw crusher. At that time the rolls in use were of relatively small diameter working at very low speeds and they were not so well suited for intermediate crushing as the jaw machines, assuming that the latter could be made to reduce the material sufficiently fine without choking.

The Goodmans fine crusher, illustrated in Fig. 1, is an early example of a machine with the roll-jaw movement. This breaker was in service prior to 1875. It comprised a framework for holding a fast jaw and a lever-casting containing the moving jaw and working inside the housing. The lever was supported at its tail end on a slide block carried on the first motion shaft and an eccentric shaft passed through the head end close behind the moving jaw. The two shafts were geared together so that the rotary motion of the countershaft was transmitted to the eccentric and imparted a circular movement to the end of the lever, which was modified at the crushing face by the influence of the fulcrum at the tail end of the lever.

The first-motion shaft was not essential to the mechanism, and a fixed pin could have been used in its place. It was probably considered advisable to utilize the purchase of a gear drive, and the countershaft was then made to serve a double purpose. The crushing stroke comprised a rotary forward and downward movement followed by a withdrawal and upward swing for the drawback. The jaws had curved faces, with serrations to aid in gripping the material. The mechanical efficiency was very low and the machine did not long survive.

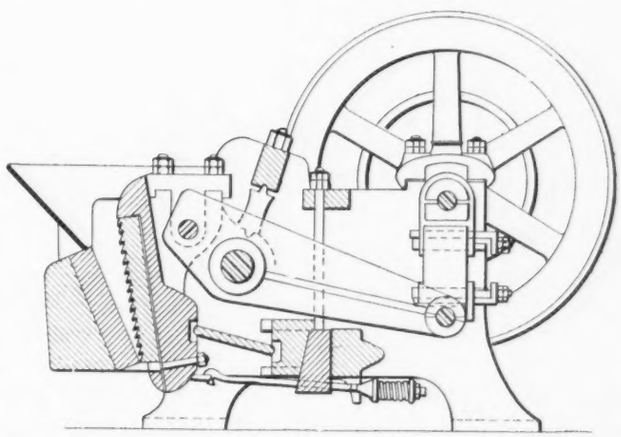


Fig. 2—The Marsden crusher, patented in 1883, also had a roll jaw movement. It was specially designed for fine crushing

Another Early Machine Designed for Fine Crushing

Marsden, who introduced the Blake jaw crusher into England, obtained a patent in 1883 for the machine shown in Fig. 2. This breaker was specially designed for the work of fine crushing. Both jaws were inclined forward, so that the weight of the moving jaw was partly supported on the material passing between the

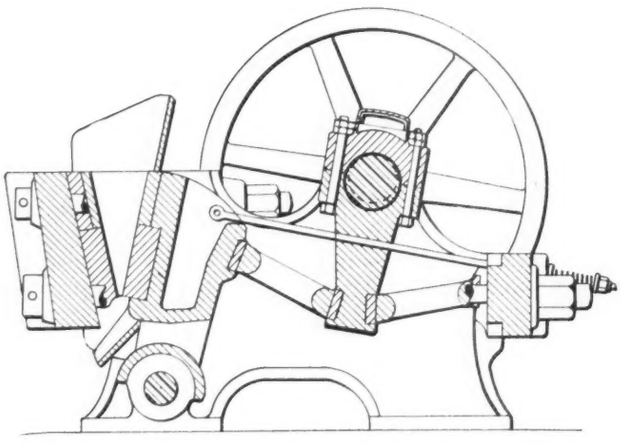


Fig. 3—The Krom breaker, illustrating the Blake mechanism adapted for fine crushing

faces. The swing jaw was pivoted and supported at one end of a rocking lever, the fulcrum shaft for the lever being situated close behind the jawstock and the movement was applied by means of a crank and connecting rod.

The crushing stroke at the bottom of the moving jaw was controlled by a single toggle plate backed by a sliding block and adjusting wedge for altering the size of the product. Crushing movement at the top of the jaw followed a radial line with the fulcrum shaft as center, and the toggle imparted a similar travel to the lower end of the jaw, the intermittent rolling motion assisting the clearing action.

Marsden built a number of these machines, but the design fell into disuse and was later supplanted by a simpler mechanism.

THE DODGE CRUSHER

The Dodge crusher is another example of a machine specially fitted for the work of intermediate or fine crushing. The design of this breaker is familiar to all mining engineers. Its mechanism is a simple one, consisting of a lever casting holding the moving jaw, the lever being supported on a fulcrum shaft pivoted in adjustable bearings resting in slides in the side frames below the level of the jaws. The lever is oscillated by an eccentric and a connecting rod from the breaker shaft.

Dodge's crusher is a useful machine, but its capacity is very limited, and any attempt to make it break finer than a ¾-in. product is pretty sure to cause trouble with the pivot bearings. Although this machine is still made and sold by a number of firms, it is not so popular as formerly and is being displaced largely by granulators of the roll-jaw type.

The Krom breaker, shown in Fig. 3, illustrates the Blake mechanism adapted for fine crushing. The jawstock, instead of being pivoted above the inlet opening, as is customary in Blake crushers, was hinged on a shaft some distance below the jaws, and by this means the crushing stroke at the exit point was kept as small as possible, making a fine setting permissible. The frame was reinforced by longitudinal tiebolts, which in some instances were fitted with cupped washers to act as safety devices in the event of a piece of metal falling into the jaws. As will be noted on examining Fig. 3 Krom was an early advocate of the rolling toggles which have lately come into prominence in connection with a new design of jaw crusher.

The engineers of the Sturtevant Mill Co. have been persevering in their efforts to improve the jaw machine as a fine crusher and have from time to time introduced new designs with this object in view. Fig. 4 is typical of an early crusher with a roll-jaw movement made by the company and patented in 1898.

The motion in the ordinary Blake crusher compressed the material over the whole surface area of the jaws at one and the same time, whereas, with the construction illustrated, the working face was made to roll over the material with a mortar-and-pestle action, the area under pressure at any given period being limited to approximately half that in the Blake machine.

In the design shown, the rolling jaw was carried in a long lever which was backed by short toggles. These toggles are not very clear in the figure, but the end of the lever was forked and widened with the lower hinge pin for the pitman spanning the gap, and the two toggles

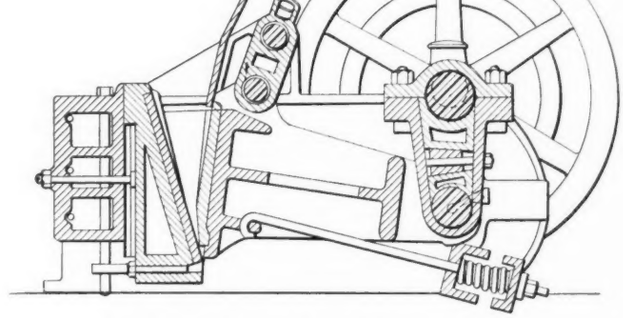


Fig. 4—Another early crusher with a roll-jaw movement. It was patented by the Sturtevant Mill Co. in 1898

were arranged to work in grooved bearings fitted into the outer prongs of the fork.

The lever was carried at its forward end on a heavy cast link in such a manner that it was free to move forward bodily in a radial line from the fixed pin center. The crushing movement was applied to the lever by means of the pitman or connecting rod and the force was multiplied by the lever and toggle mechanism. In this machine the size of the finished product was adjusted by raising or lowering the sliding block containing the fixed jaw. Unless the pitman bearings were carefully adjusted for wear, slackness at the journals caused a heavy and destructive pounding action. This machine, also, like most of the fine crushers, was subject to damage resulting through careless adjustment of the minimum aperture between the jaws.

DESIGN MODIFIED BY COMPANY

The construction described was ultimately discarded by the Sturtevant company for the larger units, and the company introduced the modified design shown in Fig. 5, which it has worked successfully for a number of years. The swing jaw was pivoted below the crushing cavity and the jaw plate was made relatively short, so that, although the stroke was reduced toward the outlet, the variation in travel from feed point to sizing point was not excessive and the minimum radial movement was sufficient to ensure effective crushing. This arrangement gave the greatest leverage with the minimum stroke at the bottom of the jaw, which was an advantage when crushing fine on any hard ore, but

the short stroke tended to reduce output unless the number of strokes was increased to make good the deficiency.

The swing jaw was actuated by a lever supported on a hinge pin and carrying a large roller at its free end. This roller was made to contact with an elliptical cam forming part of the rotating shaft and so shaped that the end of the lever was raised and lowered twice for each revolution of the shaft. The movement of the lever was imparted to the jawstock by means of a short pressure plate and the jaws were adjusted by changing the length of this short toggle.

The crusher sides were cut from rolled-steel plates and joined together by heavy front and end castings, making a strong and shock-resisting frame, so that these useful machines were capable of crushing exceedingly hard and tough materials, including some of the ferro-alloys.

THE SINGLE TOGGLE GRANULATOR

A simple form of jaw breaker which has gained in favor during recent years for the work of fine crushing is the single-toggle granulator shown in Fig. 6. This machine is made in a range of sizes with feed openings varying from 10x3 in. up to 36x8 in. For secondary reduction work the inlet opening is purposely kept narrow to give a moderately acute angle with jaw plates of reasonable length, and to prevent the machine from being fed with material beyond the economic range of reduction. The smaller breakers will crush as fine as

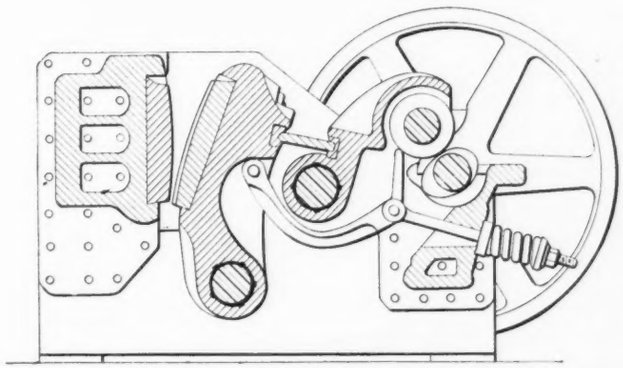


Fig. 5—In this machine, of a design modified from that of Fig. 4, effective crushing was secured, but the short stroke tended to reduce output unless the number of strokes was increased

½-in. cubes, the larger units breaking down to 1 in. and under.

Although the mechanism is a simple one, consisting as it does of an eccentric shaft passing through the head of a jawstock which is swung from the vertical position by a single toggle plate, the movement is more complex than appears on the surface. The circular path of the jawstock in proximity to the eccentric shaft changes to an elliptical motion at the bottom of the moving jaw, the vertical or major axis being equal to the throw of the eccentric, while the minor axis, which roughly represents the crushing stroke at the sizing point, may be modified by changing the angle of the toggle.

The crushing stroke is compounded of two different movements. The top of the jaw moves in an orbit with the lower toggle seat as fulcrum, while the bottom part of the jaw swings radially with the rear toggle bearing as its center of movement. Thus, the upper part of the jaw is crushing before the lower comes into action and the work is therefore concentrated over a lesser area than in the case of the pendulum motion.

This machine has one defect—namely, that, owing to the moving jaw rubbing on the material during the process of crushing, the wear on the jaw plates is a serious item when breaking any abrasive substance. This granulator is particularly useful for fine crushing, because the effective stroke decreases from top to bottom of the jaw, and the tendency to clog, which is usually present when the movement is restricted, is largely neutralized by the lively rolling action of the moving jaw.

In the machine illustrated the frame is made from heavy rolled-steel plates, which are cut and pressed to shape so that the halves meet at the center line and are connected by a strong buttstrap at either end. This form of construction is unusual and the frames may be solid castings in either iron or steel.

GYRATORY VERSUS JAW CRUSHER

In the United States the gyratory crusher is generally preferred for secondary breaking, as this machine is capable of giving a greater output from a small unit than is possible in the case of the jaw crusher, but, when dealing with abrasive material such as traprock, silica stone, and some of the iron ores, the crushing surfaces wear so fast that it is necessary to make frequent adjustments and reset the concaves at short intervals, which means loss of time and considerable expense. In addition, only a small amount of metal can be worn away from the mantle and concaves before they have to be discarded entirely.

With the jaw crusher it is a simple matter to adjust the toggles to close the jaws and maintain the desired product, and the jaw plates can be reversed and replaced with much greater ease than in the case of the wearing faces in the gyratory breaker. There is, therefore, a demand for jaw crushers specially designed for handling the abrasive rocks and capable of giving a large output of relatively fine material when operating as secondary breakers. The Traylor Engineering & Manufacturing Co. make special machines for this duty, and Fig. 7 is made from a sectional drawing of one of the largest crushers in the series. This breaker has a feed opening measuring 72x10 in. and, when crushing hard iron ore, it easily handles 75 tons per hour, breaking

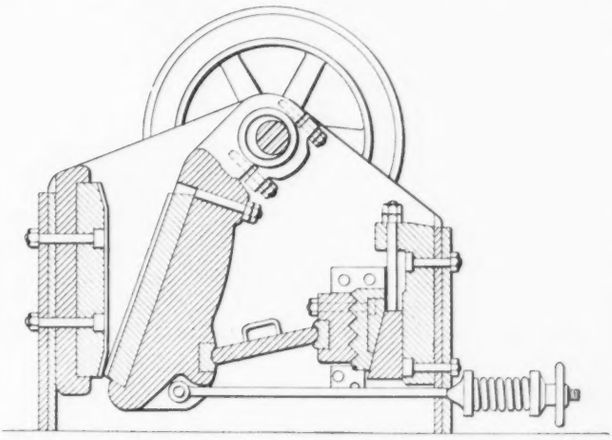


Fig. 6—The single toggle granulator—a simple form of breaker for fine crushing

4 to 5-in. feed and giving a product of 1½ in. and under. The speed varies from 150 to 200 r.p.m. and the machine requires about 50 hp. The frame is made of cast iron reinforced by a steel band shrunk in position. The band or link is so disposed that the light frame casting is practically free from tensional strains.

The pitman consists of a bearing cap from which depends two forged-steel rods provided with contracting nuts of the ball-and-socket type which seat themselves

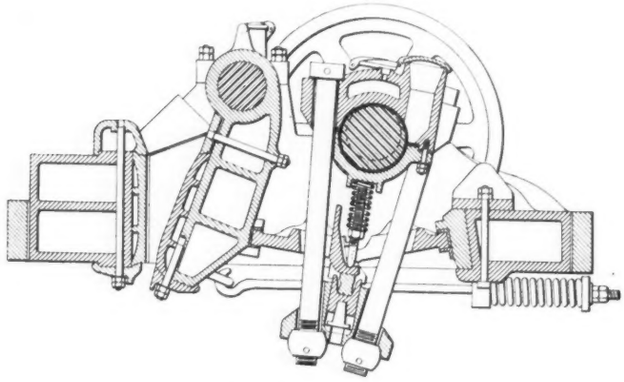


Fig. 7—A jaw crusher designed for handling abrasive rocks and capable of giving a large output of relatively fine material when working as a secondary breaker

in proper alignment and grip the threads so that they cannot strip. A light bottom cover is fitted below the eccentric bearing to exclude the dust and retain the lubricant, and the toggles are held down on the rocker by an adjustable spring device inserted between the cover and the toggles so that the parts of the pitman are kept in contact on the downward stroke when the crushing pressure is released.

The outermost toggle bearings are of the rolling type, but for the central connection the toggle joint follows the knuckle design. It should be noted that this toggle system is not affected by the intervention of a third member such as the pitman body; the plates meet at the center.

Device Guards Against Tramp Iron

A safety device is incorporated in the pitman which consists of a circular punch arranged to perforate a steel bar when the load exceeds a given figure. Should any tramp metal fall between the jaws, the increased pressure on the punch causes this to penetrate the plate and allows the toggles to fall until they come to rest on stop screws. The pitman keeps on rising and falling, but does not actuate the swing jaw, since the connection between the rocker and the toggles has been broken. When the obstruction has been removed the toggles require to be jacked up and the pitman raised to its highest position, which allows the bar to be moved slightly so as to present another surface under the punch. This device has proved effective and economical in service and is said to be much more reliable than shearing toggles, breaking blocks, and other contrivances of a similar nature.

The pitman cap and the lower half casings in the frame bearings for the eccentric shaft are water-jacketed and self-aligning; the latter feature ensures uniform loading over the entire bearing surface and takes care of any unevenness due to irregular wear.

Bearings are lubricated with grease, which is replenished once each day, and the lubricant is prevented from escaping too freely by means of wool yarn packed against the journals.

It is probable that the jaw crusher will continue to hold its position as a secondary breaker for many purposes in small plants. It is capable of making a larger reduction in a single stage than almost any other type of re-crusher. In special cases the machines can be set to give a product as fine as ½-in. cubes and under. For chemical works and many industries outside the mining field, where small units are essential, the jaw breaker offers many advantages. Its outstanding merits are simplicity, accessibility, and adaptability.

Manganese Production Decreases in 1926

The shipments of high-grade manganese ore, containing 35 per cent or more of manganese, from the mines in the United States in 1926 were slightly less than half as large as similar shipments in 1925, according to the U. S. Bureau of Mines. Shipments in 1926 by forty-five producers amounted to 46,258 long tons, compared with 98,324 long tons by forty-two producers in 1925. This decrease was due to the falling off of the shipments from Montana.

Domestic production of metallurgical ore in 1926 was 26,530 tons; that of chemical ore, 19,728 tons. Montana was the largest shipper, with 5,713 tons of metallurgical ore and 17,904 tons of chemical ore. The largest individual shipper of metallurgical ore was the Crescent mine, in the Olympic Mountain region, Clallam County, Wash., from which the shipments for the year were 3,162 tons. The mine was operated by lessees and reverted to the owners in July, and thereafter to the close of the year no ore was shipped.

There was no output of high-grade ore from Leadville, Colo., during the year. Some of the producers claim they cannot operate commercially under present prices. The production of Colorado during the last four years has been: 1923, 2,278 tons; 1924, 5,338 tons; 1925, 743 tons; and in 1926 no production was reported. The price of manganese during the period mentioned has been relatively constant.

Material decrease was reported in the shipments of high-grade ore from Arkansas. In 1925 this state produced 3,517 tons and in 1926, 2,450 tons. During the year two properties were equipped for the production of low-grade ores, ranging from 20 to 30 per cent manganese. For the first time Idaho shipped manganese ore. During 1926 800 tons of metallurgical ore and 30 tons of chemical ore were shipped.

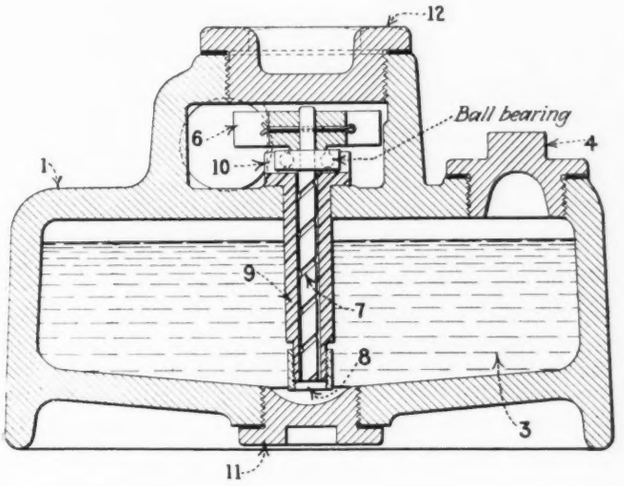
Shipments of domestic ore containing 10 to 35 per cent manganese (ferruginous manganese ore) increased from 267,252 tons, valued at $915,316, in 1925 to 364,312 tons, valued at $1,179,429, in 1926. This increase is due to the larger production in Michigan, Minnesota, and New Mexico. Domestic shipments of ore containing from 5 to 10 per cent manganese (manganiferous iron ores) were 835,412 tons in 1926, valued at $1,934,381, compared with 1,153,268 tons in 1925, valued at $2,799,403. This decrease may be largely attributed to the elimination of the Wisconsin production, as the manganese content in the ores shipped fell below 5 per cent in 1926.

Useful Operating Ideas

Improved Lubricator for Air Compressors

By C. S. Watt

In the accompanying illustration is shown an improved lubricator for compressed-air machines (Patent No. 1,615,594) that was recently invented by L. P. Marcell, chief mechanical engineer at the Dome Mines, S. Porcupine, Ont. This lubricator was designed by the



An improved lubricator for compressed-air machines

mechanical engineering staff, and afterward tried out underground on the rock drills. Here it gave excellent and efficient results in respect to providing a flow of atomized oil to the operating parts of the machine, that is steady, continuous and proportionate to the speed at which the machine is operated.

The lubricator has also been tested with an emulsified mixture of oil and antiseptic water which prevents poisoning of flesh wounds and lubricates more efficiently than with oil only. Where price is the determining factor a lubricator that can use this mixture, which costs only 5c. a quart, is economical, from this point of view. The mine executive realizes the importance of having a suitable lubricant, properly applied, which will result in long drill life and decreased operating costs.

Use of this lubricator is not confined to rock drills. It is also suitable for air hoists, steel sharpeners, and all machinery using compressed air as a motive fluid.

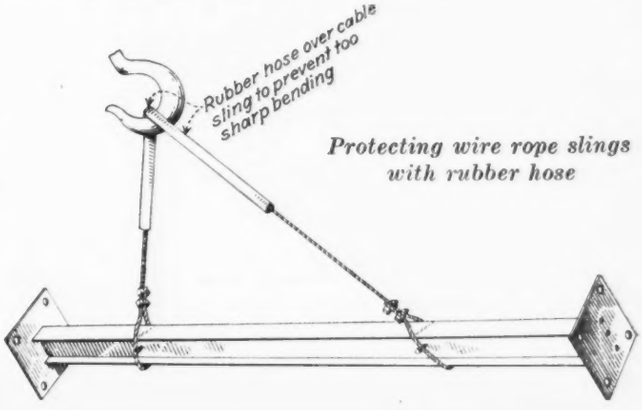
The drawing shows a sectional plan and elevation of the device, which, having few parts, is simple in both construction and operation. It consists of an oil container (1) which is connected to the air line pipe (2). The chamber (3) is filled with oil by removing the plug (4). The compressed air on its way through the passage (5) revolves a runner (6) in proportion to the amount of air being used, without interfering with its own travel. As it runs on a ball-bearing, the friction incident to operation is practically negligible. The runner spindle (7), having a spiral groove on the outside, pulls the oil through a filter (8), up a bushing (9), and out through a slot (10) in the bushing, where the oil then becomes atomized in a passageway (5) and travels on through a pipe line (2) until it reaches the machine. The lubricator is provided with a drain plug (11), and also with an inspection plug (12), by means of which the runner (6) and bushing (9) can be removed as one unit.

It is to be noted particularly that in this lubricator the spindle and pump structure at no portion thereof are in direct line with the traveling air except the slightly inwardly projecting portions of the runner blades; hence any foreign material left in the air line will pass the lubricator without interfering with its operation.

How to Protect Cable Slings

By Charles Labbe

Where wire rope slings are used over hooks, as shown in the accompanying illustration, the wire rope can be protected from injury and from too sharp a bend by slipping over it a piece of heavy, discarded hose before looping the ends of the rope. The hose section should be short so as to permit inspection of the rope and can be slipped along to where it is needed.

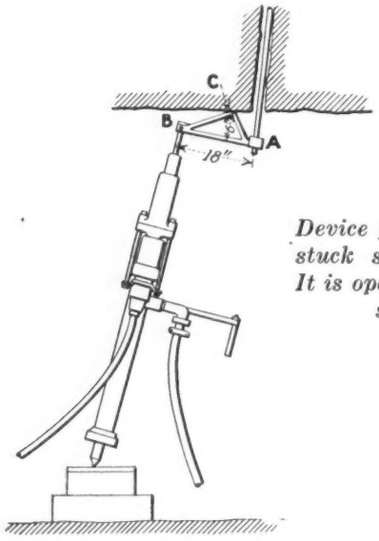


Protecting wire rope slings with rubber hose

Pulling Stuck Stoper Steels

By E. B. Foster

The accompanying sketch illustrates a method which I have found useful in pulling stuck stoper steels from "uppers." The tool is in section like an acute triangle, the fulcrum point *C* being about 6 in. above the lower



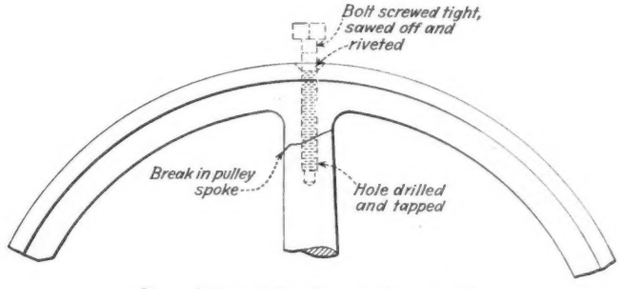
Device for loosening stuck stoper steels. It is operated by the stoper

bar. The end *A* is made like a steel wrench and to fit the section of drill steel in use. At the end *B* of the lever a short piece of drill steel is hinged, the opposite end of this piece of steel being shaped to fit the drill chuck of a stoper. In using the device, the end *A* is placed over the stuck drill steel and run up as far as possible. A stoper is used to supply the blows necessary to dislodge the steel. Two or three adjustments of the tool may be necessary. I have successfully tried out the idea.

Repair of a Broken Pulley Spoke

By Charles Labbe

The spoke of a large iron pulley was broken in transit or through casting strains, and in the absence of another pulley it was necessary to repair it, which was done by drilling a $\frac{5}{8}$-in. hole 3 in. deep and tapping it out to $\frac{3}{4}$ in. at the bottom of the threads. The hole in the rim



Repairing a broken pulley spoke

was countersunk. A $\frac{3}{4}$-in. bolt was threaded for a length of 3 in. and screwed in tightly. It was sawed off $\frac{1}{8}$ in. above the countersunk portion and the projecting end peened down and filed smooth. After a year of service the pulley was still in satisfactory condition.

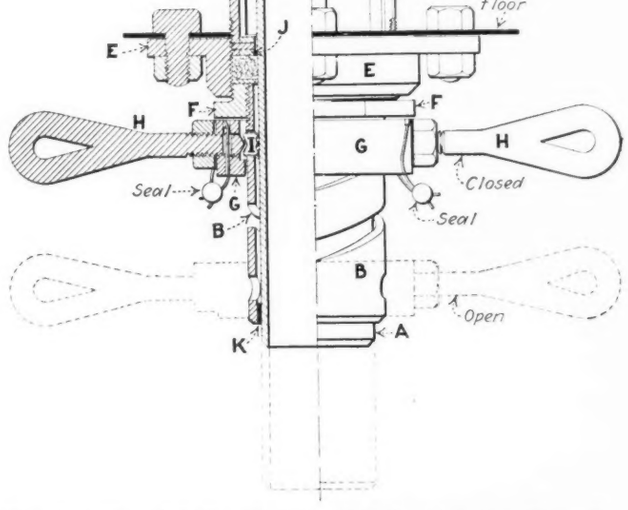
A New Hutch Valve for Harz Jigs

By A. B. Sabin

The valve shown in the accompanying cut was designed by me to remove the hutch product from Harz jigs. Neither a globe valve nor a gate valve is satisfactory, because of the grains of sand which get into the mechanism and spoil the seats. The novelty of this hutch valve consists in shutting off the solids by a telescopic action of two pipes, permitting the valve to seat with a minimum of solid particles at the surfaces in contact.

The moving pipe is marked *A* in the illustration. It is 2 in. in size. The closed position is shown in heavy line, the open position in light line. The other pipe is *C*. It is here a 3-in. nipple into which ports have been cut. *C* is entirely inside the jig and surrounded by the hutch. The upper end is closed by a cap *D*.

Suppose the valve is in open position with the upper end of *A* at the level of the jig floor. Hutch and water



Construction details of a new hutch valve for Harz jigs

would pass through the ports in *C* over the lip of *A* and down into whatever receptacle has been placed below.

Suppose the valve is being closed. As the upper lip of *A* passes the top of the ports in *C*, the solids will be cut off, allowing the lip to seat against the rubber disk.

I is one of two short shoes, opposite each other, which are firmly held against *A* by pressure from two handles *H*. *G* is a supporting ring for the handles *H*, taking the tension between them. The motion of *A* is caused by shoes *I* following the helical slot in the 2½-in. pipe *B* when force is applied to the handles *H*. *E* is a 3-in. flange bolted to the bottom of the jig. By loosening the four supporting bolts the whole valve may be removed for inspection or repair. *F* is a 3x2½-in. pipe bushing. *J* is a plain bushing riveted into *C*. Above *F* is a washer to take the wear of *F* when adjusting the pressure on the packing. *J* and *K* serve as guides for *A*. The seals are to prevent tampering when the jig contains valuable mineral. This valve may be made of pipe fittings of other sizes than those given if desired.

Discussion

The Female Factor in the Mining Equation

THE EDITOR:

Sir—Married men are the most reliable men around a mine, but it isn't because they are married. Now, isn't that a queer proposition? It's true, however, and if you have time to follow a devious argument, I'll try to prove it.

My first experience with the female factor in the mining equation was up in Cripple Creek back in the gay nineties. Two of us had a good contract and we were making better than wages, when one morning on going off night shift my partner met me at the shaft mouth and told me that he was going to quit and pull out. When I wanted to know what was up, all that I could get out of him was that his wife was sore at the camp, and that they were moving. Later on, when he had cooled down a bit, I found that the whole thing started over his wife not getting a bid to a euchre party that the wife of the superintendent was giving. Anyway, he quit; and I tried to keep the contract going with the help of a good jigger boss that I had. I did too for awhile, or rather until he got to making eyes at the lady friend of a faro dealer down in the Monarch, and then all at once I didn't have any jigger boss for a week, or until he could take the bandages off.

I tried to stand double shift while he was laid up, but you know how it is; things didn't seem to break right; so one morning old man Burns called me in and remarked that we were about due for a hard winter and that the weather was a little kinder down in Old Mexico, where he thought I ought to go, and then ended up by handing me a little remembrance in the way of a note for settlement of what was coming to me.

Well, you know, about eight years afterward I met my old partner down in Arizona, where he had got to be a super, and he staked me to a job, and I stayed with him for several months. He was one of the best bosses I every worked for; his men liked him and he was making a go of the job. He is still a good man and has held on to his present job for many years.

I almost forgot to say that his wife died shortly before he got the Arizona job. Maybe that's why.

After leaving Cripple Creek I worked down into Mexico as the old man advised, and one fine day I tackled a job shifting in a ten-stamp mill at a little mine that some New Yorkers were trying to make a go of. I didn't know any more about a stamp mill than Noah did about radio, but I needed a job and they needed a shift boss bad, and pretty soon I found out why.

It seems that the super's wife was one of those super-religious women that want to reform the whole world; so she got her old man to put in an order that the men couldn't bring beer up to the mess house, nor play cards in the dining room. Just imagine! a hundred kilometers from the nearest city, and nothing going on to keep away the willies when one was off of the job.

Well, I got along for a while. Promotion was rapid, as the men kept the road hot leaving camp; but one day when the old man was down at the Capital fixing up some legal stuff and me in charge of the mill, the old lady sails down my way and hails me, "Hello, Slim! How much water you got up in the reservoir?" Says I, "Just about enough to run until tomorrow providing they get to pumping pretty soon."

"Well, hang up," says she; "I need it all for my garden." Say, Brother, right there I foamed over. I don't know what I said, but she chases back up to her house and likes to get the telephone girl crazy before she got her old man on the phone down in town.

Well, he caught the first train back; and maybe he didn't tell me where to head in. He told me if I was in camp next day he would work my head over to suit his taste; and the worst part of it was that he was just about enough of a he-man to do it. So I slid.

They shut the mine down before long, and the reason that I hear was that the overhead was too heavy. I didn't get next to that saying until a lady friend told me that skirts always go on overhead. (Sic!—ED.)

Experience is a valuable instructor, as the good book says, so little by little I kept getting better jobs until once upon a time I got to be a superintendent myself. I hadn't had any chance when I was a kid to get much schooling, so an engineer was always quite a mystery to me, until the head office sent me a young chap that had been out of school several years and was real human. He showed me where to pick up some ore that had been faulted to one side of the main body; and was white enough to show me how he figured the location; and even made his report show that I had found it myself, when I never would have put in that crosscut if he hadn't begged me to.

Well, life moved along, and one day he went on his vacation and came back married. Say! she was a peach. She used to come down with him to the office when he came to work, and always was waiting to meet him when he went off shift. She got to slipping into the drafting room and loafing with him quite a lot, and she even got him to wearing such good clothes that he couldn't go underground until he changed. After awhile she began to miss Boston, and then she had to go home for a visit. She never came back, but the engineer soon followed, and now is a clerk, where he don't have to dirty his hands. And I had hopes for him, too.

The joke wasn't always on the other fellow either. Some will remember the red-headed girl that used to work in that broker's office up in Butte. Well, I always was touchy on red hair. You can always see it easier in the soup. Yes, she put me over the jumps just like she did the rest. Three of us had it all fixed up to go up and take a crack at a lease in the Coeur d'Alenes, but she happened to have a run of hard luck just then and talked me into parting with my roll as a loan, giving me as guarantee some stock that she had in an Arizona mine. Well, I've still got the stock; her sister sent her a hurry-up call to come down to Denver; my partners took on another guy, and the three made a stake; and there you are.

Now, I started out to prove something to you, but it

seems that I've got a long way off of my trail; so here is my final argument. If a fellow is a comer, leave it to the girls to spot him before the G.M. does; so that before he is given a chance at a real job Miss Sweetie has him hog tied. It isn't because he is married that he is a good man; but he is married because he is a good man. S. S.

Mexico City, Mexico.

Superiority of the Old-Time Prospector

THE EDITOR:

Sir—Perhaps a few more words in behalf of the old-fashioned prospector will not be amiss. Prospecting cannot be learned from books, and I am a great believer in the man who has roughed it. I learned prospecting from my father and others of the old school, who were practical and successful prospectors. That many of these old-time prospectors are today still prospecting is because they did not take care of their money when given them in lump sums for their original finds.

From my experience gained in contact with some of those who have a technical mining education I find that it is not worth a hoot in hades when it comes to bush work and examining rocks, formation of rocks, proximity of waters (lakes and rivers) to ore deposits. I think this is proved by the amazingly few technical men who have discovered real paying ore. One has to think hard to name one. The college graduate cannot, or does not want to, except in a few cases, face the hard tramping and packing that is necessary when prospecting. If he finds some bright specks in rocks he wants his books, whereas the practical man uses his pen-knife under a glass to determine their value. Stripping and trenching are two jobs not cared for by the student. The practical man likes it. WILLIAM G. MICK.

Toronto.

Ownership and Operation of Lake Superior Iron Ores in Fewer Hands

THE EDITOR:

Sir—Apropos of Mr. Woodbridge's article under the above caption in *Engineering and Mining Journal* of May 14, 1927, I apprehend the reasons why ownership and operation of Lake Superior iron ores are in fewer hands are as follows:

Iron and steel works of the Eastern United States are approximately 46 per cent "overconstructed"; that is to say, if they were operated at full capacity all the time they would produce 46 per cent more product than there is demand for. The result of this condition is that they must run at part capacity or shut down part of the time. Running at low capacity or shutting down is very expensive business for iron and steel works and necessarily adds much to the first cost of iron and steel products or corresponding losses to the producers thereof. This condition bears heaviest on the smaller iron and steel works, the "independents," so called. The bigger iron and steel producers, having larger facilities and owning and operating their own iron mines and in several cases their own boats and railroads, thereby securing their iron ores very cheaply, can produce iron and steel more cheaply than their smaller competitors who do not own their own iron mines but have to buy ore in the open market. Therefore the larger operators can dictate the prices of iron and steel products, and do dictate them at figures which, in the long run, cause the smaller operators to operate at a loss and consequently to go out of business or merge with the larger companies. The latter alternative has been seized upon by many.

It goes without saying that under such conditions the smaller manufacturers cannot pay the iron-ore miners high or even reasonable prices for iron ores. This fact, combined with outrageous taxation of iron mines, has caused the iron-ore business in the Lake Superior districts, for individual iron-ore miners and independent iron-ore mining companies, to be poor for many years past, and it will remain poor for them in the future. The remainder of the iron ore mines still owned by them will gradually slide into the hands of the large iron and steel manufacturing companies and the individual iron-ore mine owner and operator in the Lake Superior country will become extinct!

Spokane, Wash. CHESTER T. KENNAN

The Tariff on Manganese

THE EDITOR:

Sir—I notice in the *E. & M. J.* of April 30 an editorial on manganese, on page 741, in which it is mentioned that there was a meeting at Cleveland, Ohio, where an effort was made to have the government remove the tariff on manganese. The principal point in the argument was that no manganese was produced in this country and that by putting a duty upon it the general public was compelled to pay a large amount of money by reason of the import duty and that the government ought to remove the tariff and buy manganese in foreign countries and store it here. This seems to me a subterfuge and very illogical. It will be remembered that at the opening of the World War only a small amount of manganese was developed in this country, but during the war millions of dollars were expended in investigating and developing manganese deposits in the United States. The result of this was that at the close of the war many deposits were open and ready for market, but after the armistice was signed shipments were stopped and most of these manganese deposits have remained idle.

I am interested in one of the largest deposits in the United States, in Clark County, Nev. The ore is pyrolusite. We have expended $75,000 in developing this property, and the mining engineers who have examined it say that we have opened up 100,000 tons of ore. We think that there is a probability of several hundred thousand tons more. This ore runs from 35 to 55 per cent.

There are other large deposits of manganese ore throughout the West, and if the government would make possible the development of this ore, we could easily supply the demand in the United States. Owing to the low tariff and to freight rates, we are unable to handle it at present unless we can get a contract for a very large tonnage.

It seems to me that those who are interested in removing the tariff from manganese ores are doing so not for the benefit of the general public nor for the government but to benefit individual enterprises. The truth of the matter is that instead of removing the tariff, a higher rate should be fixed on imports so that our ore industry could be developed here in the United States without bringing this ore from foreign countries.

Los Angeles. JAMES DONOVAN.

News of the Week

Summary

IMPORTANCE IS ATTACHED to the study of manganese-bearing materials by the U. S. Tariff Commission, as the conclusions resulting therefrom will be applicable to many of the other commodities of the so-called consumption tax group. In the study, the effect of duties on research is to be considered.

Copper shipments out of the Michigan district are brisk; shipments by boat exceed those of a year ago and rail shipments are unusually heavy. Export business is small, with only a few orders going to France.

Tonopah bullion shipments improved in May to $155,600, compared with $134,000 in April. The increase is due principally to larger production by the Tonopah Mining Co. and the Tonopah Extension Mining Co.

Recent exploration work on the Amulet property, in the Rouyn district of Quebec, indicates ore occurrences there to be of considerable importance.

Shares of lead producers fall on the London exchange; there is talk of overproduction and a consequent decrease in forthcoming dividends.

Unusual activity is reported in the Parral district of Chihuahua; six mills are in operation and daily ore-train shipments are being made. A mineral concession covering 2,225,000 acres in Nueva Leon, Coahuila, and Chihuahua is granted by the Mexican Department of Mines to a syndicate formed by California capitalists.

A geologic and magnetic survey of areas in the upper peninsula of Michigan possibly underlain by iron and copper deposits is in progress under the direction of L. P. Barrett, of the Michigan Geological Survey.

Construction will start at once on a large sulphuric acid plant at the Consolidated Mining & Smelting Co.'s Trail smelter in British Columbia, according to a report just received.

A consolidation of the Eustis and Albert mines, at Capelton, Quebec, takes place under the name of the Consolidated Copper & Sulphur Co.

A promising new gold strike is reported in Southern Rhodesia on the Umfurdzi River. A discovery of tin is stated to have been made between Shamva and Simoona.

Tariff Commission to Begin Study of Manganese

Investigation Represents Other Commodities of the Consumption Tax Group—Effect of Duties on Research to Be Considered

By Paul Wooton
Special Washington Correspondent

THE STUDY to be made by the U. S. Tariff Commission of manganese-bearing materials will begin immediately after its appropriations for the next fiscal year become available on July 1. As the investigation will be made under the general powers of the commission, rather than under the flexible tariff clause, the study will cover all the manganese-bearing materials, whether dutiable or not. Conditions of production and distribution will be studied, imports will be analyzed, and all factors bearing on the situation considered.

The investigation is regarded as one of great importance, because manganese is typical of other commodities which fall into the so-called consumption tax group. In various instances, duties fixed in the tariff act of 1922 have failed to develop domestic industries commensurate with the cost to the public and now come in for technical consideration as duties for revenue. In the case of manganese, consuming industries in 1926 paid $8,000,000 in duties. The value of high-grade manganese ore produced domestically was $300,000. The object is to build up a record of all facts bearing on the situation, so that a decision may be made as to whether the benefits, present and prospective, justify a tax of $8,000,000 annually. The collected data are expected to establish the extent to which the tax is passed on to the ultimate consumer.

A phase of the tariff question which has not been emphasized in the past is the effect of duties on research. The rise of research work in industry has caused the point to be raised that a tariff may be justified by the research it encourages, and should not be judged only on the ground of actual production created. It is evident, however, that Congress will want information which will enable it to draw a very distinct line between the probable and the possible in research. Many substances are produced synthetically, but it hardly is probable that Congress could be induced to levy many duties on the assumption that inventive genius would be encouraged to produce a synthetic product to take the place of an imported natural product.

Those opposed to the present manganese schedule already have acquainted the Tariff Commission with their view that research has failed in that no process has been developed, after five years of the duty, which can be substituted for that requiring high-grade manganese ores. No duty, they say, will put high-grade ores into the ground. They suggest that if the domestic manganese question is to be solved it should be approached as was the development of copper from the porphyry deposits. The various metallurgical problems were solved and the metal was made available at prices less than those which then prevailed, without a tariff or bonus.

In the course of its study the Tariff Commission expects to ascertain the foreign and domestic costs of producing ores, concentrates, and ferromanganese.

The Bureau of Mines has just issued a statement on manganese of which the following is an extract:

"In the United States the production of manganese, except during a few years prior to the advent of the bessemer and open-hearth processes for making steel, has never been able to satisfy the domestic demand. The occurrences of manganese in this country are, broadly speaking, well known, and if the past history of mining of this metal is taken to indicate the trend of the future, the United States does not possess a supply that can meet its demands. Unless methods are evolved for beneficiating low-grade manganiferous ores, this country must remain dependent upon foreign sources as long as

manganese is required in the manufacture of steel.

"Mining of manganese in the United States began in 1832 at the Paddy Run mine, Frederick County, Va., and during the first few years of its operation some 5,000 tons of high-grade ore were shipped to England. During the years 1885 to 1890, inclusive, the Crimora mine, of Augusta County, Va., supplied a large part of the needs of the Carnegie Steel Co. Since 1890 the domestic production has ranged from a fraction of 1 per cent of the domestic needs to some 32 per cent during the war years of 1917 and 1918. The ores produced during these years were mixed with high-grade imported ores in order to render them usable; and their utilization was made possible only by modification of peace-time specifications. Except for the chemical ores produced in the Philipsburg district of Montana, the supply of high-grade metallurgical manganese ores in the United States is meager."

Cape Breton Gypsum Output Meets Demands

Considerable activity exists in the gypsum industry in the vicinity of Windsor, in Cape Breton; a number of new projects are being exploited, but most of them are stock propositions at present. Production from the operating companies is well ahead of that of last year. Although navigation opened early in the Bay of Fundy and Minas Basin, it was late in the Bras D'Or and east and west coasts of Cape Breton. Output from the existing companies seems to be amply taking care of consumption at the present time.

Many Claims Are Staked in the Topley District

During the last month more than a hundred mining claims have been staked in the Topley district of British Columbia. This activity follows the staking of gold claims by one prospector last June and subsequent development by the Standard Silver Lead Co., of Spokane, which secured the property and is carrying on active development operations.

Supreme Court to Review Tariff Case

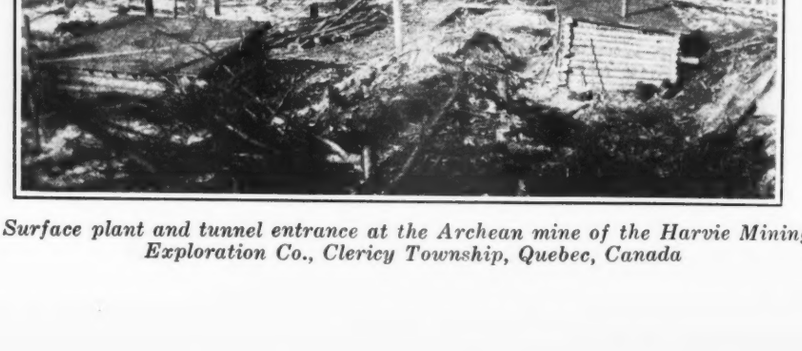
The United States Supreme Court on June 6 granted a petition for a writ of certiorari by which it will review the decision of the United States Court of Customs Appeals in the case of J. W. Hampton, Jr., against the government. This case involves the constitutionality of the flexible tariff, Hampton contending that the proclamation of the President increasing the duty on barium dioxide, after a report by the Tariff Commission that the rate fixed in the 1922 tariff act was insufficient to equalize cost of production here and abroad, was illegal. The Court of Customs Appeals upheld the constitutionality of the act. The case will be heard at the fall term of the court.

Alaska Juneau in May

In May Alaska Juneau mined and trammed to mill 397,400 tons, from which a recovery of $168,500 is reported or 42.40c. per ton. Operating expenditures totaled $182,200, or 45.85c. per ton, and operating loss $13,700, or 3.45c. per ton. Other expenditures totaled $19,300, resulting in a deficit of $33,000 for the month.

Harvie Company Acquires More Claims in Clericy Field

Acquisition of an option on the last group of claims needed to round out exclusive control of its Clericy field, in northwestern Quebec, is announced by the Harvie Mining Exploration Co., Ltd. With the addition of these claims the company now controls a solid block of claims seven miles in length by one mile in width, stretched along the granite intrusion, which is the important geological feature of the Clericy field. The company is now proceeding with four separate mining operations situated approximately one mile apart and paralleling the granite contact. Two or three shifts per day are being employed at all of the company's operations. Underground development is being pushed. The company's Archean mine and camp are shown in the accompanying photographs.



Surface plant and tunnel entrance at the Archean mine of the Harvie Mining Exploration Co., Clericy Township, Quebec, Canada

Joplin-Miami District Dull

Sale of Zinc Concentrates in May Smallest for Any Four Weeks in Five Years

Continued unattractive prices for zinc and lead ore have produced considerable dullness in the Joplin-Miami field. Production is at a low ebb, and there is little prospecting. The sale of zinc ore in May was the smallest it has been for any four weeks for more than five years, being only 28,831 tons. Production was not greatly in excess of this same figure, however, so stocks in bins have not increased notably. Many miners, thrown out of work, have left the field or are engaged permanently in other industries. The sale of lead concentrates was also small for the four weeks of May, being only 5,763 tons.

Harry Neff and Richard Cole, of Joplin, with Max Berren, of Parkersville, W. Va., have purchased the mill and lease of the Huttig No. 1 mine, northeast of Picher, Okla. The property has produced more than $5,000,000 worth of ore since it was opened in 1918, and more than 50,000 tons of zinc and lead ore in the last five years. The new owners already have started drilling development of the west forty acres of the tract, formerly occupied by the mill pond. Some drilling also will be done on the north forty acres, and a new shaft probably will be sunk before the mine is placed in production.

More than 1,400 acres of land have been leased in the old Peoria section of the Joplin-Miami district by the Boston Mining & Development Co. The land lies about midway between Peoria and Seneca and has never been thoroughly prospected. The company expects to move several drills on the tract in the near future.

The Interstate Commerce Commission has ruled that proposed absorption of charges for draying ore to the loading tracks of the Southwest Missouri Railroad in the Picher district is not justified. The railroad company had proposed to absorb 30c. per ton of the draying charge on shipments of lead or zinc ore or concentrates from the wagon scales of any mine in Kansas or Oklahoma to the designated loading tracks of the carrier in the Picher district. Other railroads interposed objections, some of which were sustained by the commission, which found that the proposed plan would violate Section 6 of the Interstate Commerce Act and would create undue prejudice and preference.

Quicksilver Mines Reopen as Mercury Advances

Mercury is coming to the front again in California, with the present high prices encouraging the opening up of many old workings. The Sulphur Bank mine, in Lake County, is now working forty men under the direction of a syndicate headed by F. W. Bradley, of San Francisco. This mine produced $600,000 in four years in the early seventies and reached a production of 1,500 flasks a month. The Reed Quicksilver mine, in Yolo County, has been acquired by John Andrews, of San Francisco, who plans to reopen the property.

Good Results in Michigan Copper District Continue

Quincy's Output High—Mohawk Expects 1927 Earnings to Exceed Those of Last Year

Calumet & Hecla Consolidated has reached a depth of 9,100 ft., or the 91 level, in No. 7 Hecla shaft, which will be the operating unit below the 80 level haulageway in the Hecla conglomerate department. This is 1,100 ft. below the haulage tunnel. The electric hoist installed at the 80 level is ready to operate. Rock hoisted to the haulage level will be trammed by electric locomotives to the Red Jacket shaft, Calumet branch, for hoisting. Plats have been cut at all levels below the 86, and levels are being opened from the 81 to the 85 inclusive. The copper ground below the haulageway is richly mineralized, about 80 per cent of it being available for stoping. This is a better average than in virgin territory being opened in the five forties of the Calumet department, where about 45 per cent of the ground developed is profitable for mining. Openings from No. 7 will be extensive and a large tonnage will be available.

No. 16 shaft on Calumet & Hecla's Osceola lode is being equipped with new railroad connections with the company's main line, preparatory to the reopening of this unit later in the year. No. 16 will be the fourth Osceola lode shaft to go into operation. The three units now operating are producing a total of about 800,000 lb. of refined copper per month.

The Quincy mine is stoping its new East vein in the 86 and 87 levels of No. 2 shaft, from which rock containing high values is being mined. The vein is about 12 ft. thick and is maintaining its width at depth. This compares with a width of about 4 ft. of the Main Pewabic lode. East vein, which recently was cut in the 88 level, lies between the shaft and the main lode. The main formation shows no diminution in values. Present yield for the entire mine is averaging nearly 26 lb. of refined copper per ton of rock treated, the highest average in years. With a more favorable copper market, Quincy is in position to see its efforts to effect economies more liberally rewarded.

Mohawk operations had another good month in May, and the prospects are that earnings this year will be even better than in 1926, when over 18,000,000 lb. of copper was produced at an operating cost of 7.357c. per lb. Production for each of the months of March, April and May this year has been in excess of 2,000,000 lb. Mohawk continues to mine considerable mass copper. About 200,000 lb. of mineral per month is being obtained from this source, or about 10 per cent of the mine's output.

Mayflower-Old Colony and Arcadian Consolidated have been advised of a cut in their assessed valuation. Mayflower has been reduced $10,000, a decrease of $20,000 in two years. Arcadian has been cut $12,000 and now is assessed at a total valuation of $110,000, as compared with about a quarter of a million valuation three or four years ago. It is the policy of the Michigan state tax commission to lighten the burden of idle and exploratory properties as much as possible.

The Archean Camp of the Harvie Mining Exploration Co. at Ringrose Lake, Clericy Township, Quebec, Canada

On the Arcadian Consolidated property work has been suspended in the raise from the 11 level in the New Baltic shaft, and two crosscuts east and west are being driven from the 12 or bottom level to intersect veins which were cut in the Arcadian shaft. The east crosscut will be continued about 250 ft. to No. 8 conglomerate.

A geological and magnetic survey of areas which possibly may be underlaid by iron formations and copper-bearing rocks has been started in the upper peninsula of Michigan. The work is in charge of L. P. Barrett, state appraiser of mines and a geologist of the Michigan Geological Survey. Several parties, each consisting of three geologists and three assistants, will be sent out into the field.

The Victoria Mining Co. won a technical victory when the Michigan Legislature adjourned without passing a bill designed to give Gogebic County a right to go into court with its desire to establish a permanent level for Lake Gogebic. It was alleged that the lake level was lowered by the construction of a dam by Victoria on the Ontonagon River, an outlet for the lake.

To save operating costs, only one shaft, No. 3, now is being worked at the Baltic mine of the Copper Range company. Two shafts previously in commission, Nos. 4 and 2, have been closed since ground in Nos. 4 and 2 can be reached from No. 3, which is the deepest of the four shafts on the property, being 3,839 ft. in depth. Copper Range is holding up well in production at around 2,000,000 lb. of refined copper per month.

At Calumet & Hecla Consolidated's Cliff property in Keweenaw County, the Avery shaft is nearly free of water, the shaft having been drained to 80 ft. from the bottom. For the remainder of the draining, pumps will supplement the pneumatic air lift by means of which the chaft has been dewatered to date. No. 4 shaft will be used as the main working shaft in the property, the Avery being the drainage unit. Actual mining operations will be started in the near future. Preparations to dewater the old Phoenix shaft known as the Crocker are under way.

Copper shipments out of the Michigan district are brisk. Shipments by boat exceed those of a year ago and rail shipments are unusually heavy. A considerable amount of metal is moving to Detroit and Flint, reflecting the prosperous condition of the automotive industry. With exception of Ford, who buys direct, most of this metal is sold through agencies. Chicago, Ohio, and the Connecticut Valley also are using considerable Lake copper. Export business is small, with only a few orders going to France. In spite of a heavy rail movement throughout the winter to take care of future orders, much copper is being shipped by rail, indicating a large consumption at inland points.

The Mineral Range Railroad Co. has applied to the Interstate Commerce Commission for authority to abandon a 10-mile branch line running from St. Mary's Junction to Point Mills, in Houghton County, Mich. The branch was built and formerly was used by the Centennial Copper Mining Co., but its operation has been discontinued.

Consolidated Mining & Smelting to Erect Acid Plant at Trail

The Consolidated Mining & Smelting Co. of Canada, Ltd., according to a report just received, will erect a large sulphuric acid plant at its Trail smelter in British Columbia. Construction of the plant will start at once. The first unit it is estimated will cost $250,000.

The Milling Process at the Flin Flon Mill

In the April 9 issue of *Engineering and Mining Journal* it was stated that the process in use at the Flin Flon mill was worked out at the Colorado state experimental plant. In a letter just received from R. E. Phelan, manager of the Flin Flon mine, he advises that the process was developed at the company's test plant at 1045 Tejon St., Denver. *Engineering and Mining Journal* is glad of the opportunity presented to make correction.

The Eustis concentrator at Capelton, Quebec, Canada

Tonopah May Bullion Production Increases to $155,600

New Mills at Delamar and Gold Circle—Pioche District Activity Increases

Reports from the Tonopah district show an increase in bullion production. During May, bullion valued at $155,600 was shipped, compared to $134,000 in April. The increase was due principally to larger production by the Tonopah Mining Co. and the Tonopah Extension Mining Co. Work has been resumed in the shaft of the Tonopah Keystone, which adjoins the West End Extension and the Tonopah "76" on the west, in the extreme southwestern part of the district. To date, not sufficient work has been done to determine the value of the new showing; the shaft is now over 700 ft. deep.

The E. & H. Corporation has completed plans for the erection of a mill at Delamar. Sufficient ore is assured for the first unit, of 50 tons' daily capacity; as the property is opened up the tonnage capacity will be increased. The April Fool mine, an adjoining property, has been bonded to Immel J. Horn, and work will start in the near future. Operations have begun on the Delamar tailing piles. A. L. Scott, of Pioche, is agent for the company.

The Bristol Silver Mines Co., operating at Bristol, north of Pioche, has recently increased its daily production to 100 tons. The ore is being mined from the 700, 900, and 1,050 levels. On the 1,050 level recent development work has opened up a large body of carbonate ore, the ore occurring in the May Day fissure south of the Snyder shaft. The tonnage now being shipped is classed as a lead-silver-copper fluxing ore and goes to the International Smelting Co. at Tooele, Utah.

Diamond drilling of the Nevada Half Moon Mining Co.'s property at Pioche has been begun. At the same time, the company is driving a tunnel on a 18-in. lead of bedded ore to prospect for the down-faulted Half Moon bed in virgin territory. Murray C. Godbe, president and manager of the company, is directing operations.

The 75-ton cyanide plant of the Gold Circle Consolidated Mining Co., at Gold Circle, about 53 miles north of Battle Mountain, is completed, and a successful preliminary test run was made during the latter part of May.

Eustis and Albert Mines, at Capelton, Combined

The Eustis and Albert mines, at Capelton, Province of Quebec, Canada, have been combined under the name of Consolidated Copper & Sulphur Co. The directors of the new company will be C. W. Nichols, Julian B. Beaty, O. C. Frohnknecht, A. H. Eustis, and F. A. Eustis.

It is planned to enlarge operations and extend them to the Albert ground. Copper concentrates will be produced and also a high-grade sulphur concentrate for use in the manufacture of sulphuric acid. The Eustis property is shown in the photograph above.

Silver Suit Filed

Suit has been filed in the District of Columbia Supreme Court by ex-Senator Thomas, of Colorado, on behalf of the American Silver Producers' Association, the Della S Consolidated Mining Co. of Colorado and the Colorado Spar Consolidated Mine Co., to require the Secretary of the Treasury and Director of the Mint to purchase 14,500,000 oz. of silver at $1 per ounce under the Pittman Act of 1918. The suit is in the form of a mandamus and the government is required to answer by June 21. It is likely to be tried before the court at the September term. J. Harry Covington, former member of Congress from Maryland, former District Court Justice in Washington, and now practicing attorney, together with George P. Thomas, son of the Senator, appear as attorneys with former Senator Thomas in behalf of the silver producers, who claim that this silver must be purchased from American mines to replace silver allocated and used for subsidiary coinage, but whose allocation was revoked.

Magnesite Mining in California

Magnesite mining in California is feeling the competition of the portland cement producers, and on the whole less plastic magnesite is being produced and sold than in 1926. C. S. Maltby is operating his Livermore plant and producing both plastic and dead-burned magnesites. A new company, the Red Mountain Magnesite Co., is preparing to enter the market. The property is on Red Mountain in the Livermore district. At Porterville, Sierra Magnesite is operating a mine and plant.

New Operations in Several Arizona Districts

Miami Copper Co. Sends Tailings to Russell Gulch—Vulture Mine to Be Reopened

The Vulture mine, one of the oldest in the Wickenberg district of Arizona, has been purchased by Dan R. Finlayson and a group of Eastern capitalists, who are preparing to resume operations there. This mine has already produced $25,000,000 worth of gold, but two faulted sections of the vein had not been discovered when the mine closed down, and only a little crosscutting into the hanging wall or the footwall country was done by the former owners.

Mine operations at present consist of work above the 600 level and in the old workings. Installation of a hoist and concentrator are under way. Water to run the mill will be pumped from the old mine workings, gradually draining the mine below the 600 level —the present water level. The optimism of the new owners is a source of great encouragement to old-time prospectors and people of Wickenberg, many of whom have claims near the old Vulture.

Since the present dump site for the tailing from the mill at Miami Copper Co. at Miami has been filled to the limit of its capacity, it has been necessary for the company to purchase a new location in Russell Gulch. Construction of about three miles of flume to carry tailing to the new location has already been begun. Four tunnels will be driven through the hills and the work will be carried on simultaneously at the eight faces. These tunnels will carry an 18-in. redwood pipe, through which the mill tailing will be borne by water pressure. In addition to the tunnels, several trestles will be necessary to carry the pipe lines across the arroyos. The contract for this work is in the hands of Jack Hill, a local mining contractor.

The Belmont Mining Co. has completed arrangements for taking over fractional interests held by the Calumet & Arizona Mining Co. in three patented mining claims near Superior for $150,000. A fund of $450,000 is being provided by those interested in the company, and of this sum $150,000 will be paid out as purchase money and the remainder spent for development and other corporate purposes. About six months ago Belmont closed a $200,000 option on a group of forty claims owned by the Consolidated Holding & Trust Co., and by the deal just closed will become owner of a complete chain of 120 claims covering approximately 2,400 acres.

Final arrangements for the installation of an experimental recovery plant for the treatment of local ores and concentrates, to be located at Kingman, are being made by W. S. Murray, of New York. Mr. Murray's plans call for the handling of several thousand tons of ore and concentrates in his experiments, with which he hopes to work out a more perfect recovery of values from Mohave County ores. The plant will probably be ready for operation in about a month.

Summary of the Mining Industry in Mexico During 1926

U. S. Department of Commerce Report Indicates Year of Prosperity Despite Unfavorable Conditions

The U. S. Department of Commerce states that the Mexican mining industry is reported to have had a year of fair prosperity during 1926, in spite of a number of adverse circumstances, including high taxes, labor friction, restrictions and regulations which seriously increased the cost of production, and a striking fall in the price of silver. Continuous reduction in available supplies of ores having high metal content and the high cost of production have forced the industry to apply the most advanced metallurgical methods and improved machinery, and considerable advance in this direction is reported. Another noticeable tendency is the consolidation of interests, or the absorption of small interests by larger ones, the purpose being to reduce costs by taking advantage of the superior equipment and stronger financial resources of the larger companies, to the mutual benefit of both.

Perhaps the most striking feature of the mining situation in 1926 was the fall in silver prices in September and October, though there had been a gradual decline during preceding months. The companies most seriously affected were those whose principal product is silver, as those in Pachuca, Guanajuato, and Zacatecas, which were obliged to make reductions in personnel, abandon the poorer veins, and restrict operations to the exploitation of ores of high silver content.

The silver mining industry in Mexico is peculiarly susceptible to price fluctuations, for most of the mines have been exploited since remote times and nearly all of the richest ores have been extracted, so that they are now compelled to operate on a large scale to compensate for the low metal content. These large-scale operations allow only a small margin of profit even under favorable conditions, so that every important variation in price affects them considerably. In the mines where silver is secondary to other metals, as lead or zinc, silver quotations have little importance, because the financial results are determined almost exclusively by the price of the principal metals exploited. Lead and zinc had very satisfactory quotations in 1926, and their mines were consequently not greatly affected by the decrease in silver prices which occurred during the year.

It is noted, however, that 1926 production of silver was 2,900,000 kilos larger than that for 1925, which was a good year, and the output for October and November in 1926 was considerably higher than during any of the preceding months of that year or 1925. The depression in price did not therefore have the disastrous effect that was at first anticipated, although the companies engaged in silver mining exclusively faced an acute situation. The real explanation of the increased production of silver lies in the increased output of lead, copper, and zinc, from which large quantities of silver were obtained as by-product.

California Properties Active—Barytes Mine Reopened

At Alta, Calif., the Democratic mine, operated by the Chemical & Pigment Co. as a source of barytes, will be reopened again and production resumed. The property is operated at intervals.

At Nashville, Eldorado County, the Peaseley stamp mill will be placed in operation. Development work is to be started at the Idaho mine, and it is expected that the Red Wing mine will be placed in operation. Completion of the grading of the Mother Lode highway in this section appears to have stimulated mining activity in the small properties and prospects.

Miners at the Engels Copper mine, in Plumas County, are reported to have made substantial contributions to the Red Cross fund for relief of flood sufferers.

The Snow Gulch mines, near Trinity Center, Trinity County, are reported to have been sold.

Eastern Manitoba Mining Camps Given Air-Mail Service

The eastern Manitoba mining camps now have an air-mail service, an agreement having been entered into between the commonwealth government and the Western Canada Airways, Ltd. The Post Office Department announces that two new post offices will be opened in the area and letters will be delivered at these points by air mail for 10c. extra postage above ordinary rates, the same as to other Canadian mining camps. Sites for the new post offices have not been selected, but it is probable that they will be at the Central Manitoba Mines townsite at Long Lake and at the San Antonio mines at Rice Lake. These points are 22 miles apart.

Western Canada Airways have also announced that regular passenger service to the Central Manitoba mining area will operate from Lac du Bonnet, the intention being to operate a triweekly service.

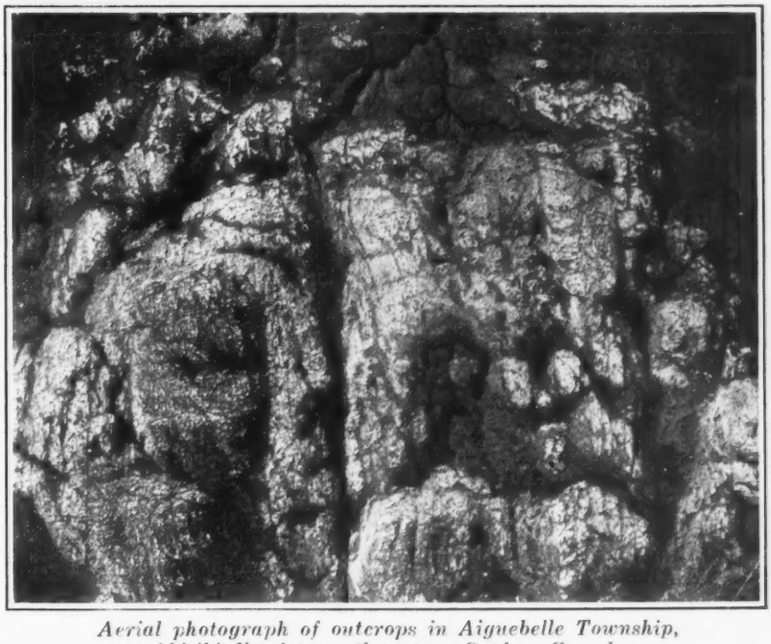
Several Districts in Canada Attracting Attention

Drilling Indicates a Large Orebody at Copper Hill Mines in Northwestern Quebec

A syndicate of Ontario capitalists has taken an option on a controlling interest in the Ferguson group of claims, situated between the Ingineka and Swanell rivers, in the Peace River region of British Columbia. The syndicate intends to spend $25,000 on the exploration and development of the claims during the present summer. J. M. Turnbull, professor of mining at the University of British Columbia, has left for the property, to advise on its development. The Consolidated Mining & Smelting Co. of Canada bonded this property several years ago, but its inaccessibility and the low prices for lead and zinc at that time prevented the company from proceeding with its development.

A report concerning the progress of current operations at the property of the Copper Hill mines, in Dufresnoy Township, northwestern Quebec, is contained in the following statement by the company's field manager, Julius M. Cohen: "We have been meeting with very marked success, and the results of our diamond drilling have been beyond my expectations. We have struck ore in every hole across widths of from 22 ft. to 54 ft., and these cores give evidence of a very large orebody. The cores show large sections of massive chalcopyrite, as well as some bornite and sphalerite."

Considerable attention is being focused on the Smithers section of British Columbia. Much favorable information has been reported in regard to the Babine range, which some engineers believe has the makings of another Slocan. Babine Bonanza mine is one of the leading operations in this section. E. G. Brown, of Vancouver, who recently announced that he was going to operate on the range, has secured the Little Joe group, which is about 22 miles north of Smithers.



Aerial photograph of outcrops in Aiguebelle Township, Abitibi district, northwestern Quebec, Canada

Toronto Letter

By Our Special Correspondent for Northern Ontario

Airplanes Take Supplies and Crew of Men to Narrow Lake Mines

Toronto, June 11—The recent exploration work on the Amulet property in Quebec indicates the ore occurrences found to be of considerable importance. Five diamond-drill holes have been put down, each of which showed ore, but the company will not definitely announce results until the orebodies have been outlined, although it is known that widths up to 32 ft. of high-grade copper ore have been penetrated. It is expected that at least eleven holes will be drilled and considerable surface work may be necessary to join up some of the showings.

The new orebody cut a short time ago on the Alderson-MacKay is understood to have a width of 50 ft. This ore apparently contains little zinc, and what zinc is found is on the margins of the orebody, so that it should be possible to obtain a good grade of copper ore practically free from zinc. It is also expected that within three months a new company will be formed on the Alderson-MacKay. This is because of the fact that the Towagmac owns a 35 per cent interest in the Alderson-MacKay, and according to the option agreement has the first underwriting privileges on shares to provide money for additional financing. The other 65 per cent, which was under option to N. A. Timmins, has been taken over by the Noranda.

On the Bagamac property, deep trenching has indicated a mineralized zone of considerable extent. At a depth of 12 ft. loose sulphides had been encountered before the solid rock was struck. A shaft is being sunk on these showings. A complete geological survey, now being made, will be followed by a diamond drilling campaign. Recently a new quartz vein was found on the surface, which has a width of 6 to 10 ft. and on which some test pits are being sunk.

On the Ribago, shaft sinking has also been started on the No. 2 showing. The shaft is down 12 ft., the first round disclosing heavy copper pyrite ore at the bottom across the full width of 6 ft. and with only one wall exposed. On the No. 1 showing, ore has been found over a width of 30 ft. and on the No. 3 assays indicate commercial ore. It is expected that the company will install a small plant in the near future, with the expectation of sinking to at least 100 ft.

Considerable disappointment has been felt by a certain class of International Nickel shareholders on account of the fact that at the last directors' meeting no further official announcement was made regarding the copper discovery and nothing was done with a view to issuing further shares. It is now expected that the company will not make a share issue, but will raise what money is necessary by the issue of short-term notes. The only business done at the meeting appears to have been the declaration of the regular quarterly dividend of 50c. a share.

A good deal of interest is expressed as to the action to be taken by N. A. Timmins Incorporated, regarding the payment on the Jackson-Manion group in the Red Lake district, which is due June 25. In some quarters it is felt that insufficient work has been done to justify any substantial payment. The vein, which is comparatively narrow, is indicated by outcrops for a considerable distance on the surface. Two diamond drills have been proving up the ground, and fourteen holes have been drilled, but the general experience throughout northern Ontario is that diamond drilling cannot be depended upon to give an accurate estimate of values in gold veins. The property is of sufficient interest, however, that even if the option is not exercised by Timmins, a plant will be installed and underground work undertaken.

Airplanes were used to take in several tons of supplies and a crew of men to open up the Narrow Lake gold mines and the Leonard Narrow Lake mining property. These two companies propose an extensive surface exploration campaign. On the Bathurst property thirty men are employed in opening up the No. 3 vein, which has been indicated for a length of 900 ft. Some small test pits have been sunk from which spectacular gold specimens have been obtained.

On the Howey property the new headframe and mining plant have been completed, and sinking is now under way with the new equipment. The shaft, which is 17 by 7 ft., was sunk to a depth of 47 ft. by hand.

Several new discoveries have been made in the past few weeks throughout this general area. Considerable free gold has been found in veins in the neighborhood of Springpole Lake, and it is understood that H. A. Wentworth, of the WAD Syndicate, has taken an option on this ground. Several promising discoveries have also been made in the neighborhood of Pipestone Bay section of Red Lake and widths up to 30 ft. have been encountered.

A new discovery was recently made on the Mining Corporation property in South Lorrain at a depth of 1,400 ft. from the surface. This ore is on the underside of the diabase sill and is the first exposure in this particular geological horizon. The vein shows a width of 8 in. On the Trout Lake property to the south, in which the Mining Corporation has a half interest, a total of 110 ft. of ore has been opened to date in a limited area. Indications point to a majority of these shoots apexing at this point, and preparations are being made to sink a winze.

On the Sylvanite property, in Kirkland, the new mill is expected to be at normal production in July. Good results have been met with in the development at the 1,500 level, where an important vein has been found recently.

On the Potterdoal property, in Munro Township, a new surface discovery of lead and copper has been made. This is the third discovery to date without taking into consideration the mineralized areas indicated by electrical prospecting.

London Letter

By W. A. Doman

Special Correspondent

Recent Report Arouses Interest in Prestea Block A Mine in West Africa

London, May 31—Owing to the fall in the price of lead—it is today £24 7s. 6d. compared with £28 16s. at the beginning of the year—the shares of companies producing the metal have been on the down grade. There is talk of overproduction and of a consequent decrease in the forthcoming dividends. The Spanish Government is taking steps to protect the lead industry, which in that country is seriously affected. This of course touches the Penarroya company, which, besides dealing with local ores, has purchased and smelted lead and zinc ores, the output of the Afra mines, in Spanish Morocco. It is stated that this group of properties will soon be floated on the London market.

West Africa has been a little in the limelight last week, and some optimistic statements are in circulation concerning the old Prestea Block A mine. This is now the property of the Gold Coast Explorers. Several months ago it was bought for about £20,000, as the original owners were unable to work it at a profit or to find additional capital. Edward J. Way, the company's consulting engineer, is now putting a different complexion upon matters by reporting that the mine contains between seventeen and eighteen million tons of ore which can be worked to give an ultimate profit of from £8,000,000 to £9,000,000.

The Ashanti Goldfields has frequently surprised its sponsors, and it is now announced that on the 22 and 21 levels a reef, thought to be the Cote D'Or, is being opened up. On the 22 level the reef is 34 ft. wide and is said to have an average assay value of 26.6 dwt.

According to a Paris message, a deposit of manganese has been discovered at Boukchpan, in the Ukraine, with metal content superior to that of the ore at Nikopole. The Soviet authorities propose to begin prospecting soon.

It is stated that a German firm in Essen has made an alloy of aluminum and steel which is described as "soft" steel, and that this will largely displace copper in electrical equipment.

Sir Abe Bailey is on his way to England from South Africa, and it is said that he, in conjunction with other financiers, is going to start a campaign in favor of Kafir shares.

An official report has now been issued on the inquiry as to the seven mines operating on the Golden Mile, Kalgoorlie. The report states that the future of the industry reposes in the ore yet to be disclosed, and suggests a pooling of resources and general cooperation. The commission recommends the establishment of a large-scale plant, preferably at Lake View, for which £150,000 would be required for necessary improvements.

Mexico City Letter

By W. L. Vail
Special Correspondent

Unusual Activity in the Parral District—2,225,000-Acre Concession Granted

Mexico City, June 1—Pittsburgh interests are reported as having examinations made on iron deposits in Lower California, one near Cape Colonett, 8 miles from the sea, and the other near the bay of San Quentin, 45 miles below San Diego.

The new director of the mining department of the government of Guatemala, Victor Argueta, is preparing a map of the republic setting forth in detail the mining zones, the classes of minerals, and data relative to the mineral deposits, with the object of stimulating the investment of foreign capital in the mines of the country. With the same object in view Guatemala is preparing a modification of her mining laws.

It is reported that work at Triunfo, Lower California, which was suspended some time ago because of the low price of arsenic, may be resumed soon, as a result of a possible betterment in prices. The plant was erected at Triunfo for the primary purpose of producing arsenic on a large scale; gold and silver, however, are also contained in the ores.

The strikes at the Peñoles property, Natividad, Oaxaca, have been settled and work is proceeding normally. A shortage of rolling stock for moving ores and supplies continues, to the detriment of the industry in the state. Ten cars of ore are being shipped monthly from the San Jose Garsona property to the A. S. & R. smelter at San Luis Potosi.

Unusual activity is reported from the Parral district, Chihuahua. The San Francisco mines are shipping 5,000 tons of concentrates monthly; the lead goes to the Peñoles smelter at Torreon and the zinc to Belgium. The company is planning the erection of a 500-ton mill for the Clarines property. Six mills are operating in the district and a trainload of concentrates and ores go out of Parral daily.

The Peñoles company is running a 3,000 meter tunnel at Ojuelas for the purpose of unwatering the upper levels and economizing on ore extraction. A. S. & R.'s smelter at Velardena, Durango, has been closed.

It is stated that the output of the La Noria mines, Zacatecas, has been increased from 7,000 to 11,000 tons, and it is the expectation of the management that the present output will be maintained. The management has been held up by bandits twice since the first of the year, at a total cost in ransom money of 15,000 pesos. At the present everything is tranquil throughout the district.

A syndicate formed by California capitalists and headed by Seth T. Heny claims to have received a mineral concession covering 2,225,000 acres of land in the states of Nueva Leon, Coahuila, and Chihuahua. Under the terms of the concession the owners have a limited time to get engineers on the ground and to make more specific denouncements, to be followed by actual exploration and development work. According to officials of the mining department a number of similar concessions are in course of study; practically all the applications come from American sources. The department expresses itself as wishing to encourage this form of investment and exploration. Several companies have been organized recently for the purpose of taking up canceled properties, since several thousand patents have recently gone by default because of requirements in the new mining law, which are considered onerous, especially when the country in many of the interior districts is unsettled.

A recent census report issued by the federal government states that only 27,842 inhabitants are engaged in the mining business in the entire republic.

Nipissing Mines May Cut Dividend

During the present month directors of the Nipissing mines, of Cobalt, will meet to discuss the dividend action. There is expectation in many quarters that the dividend will be reduced, if not passed. With the present low price of silver and the lower-grade ore being treated in the mill, profits are not nearly sufficient to pay the present rate. It is, however, possible that such action may be deferred until further exploration work has been done in Montbray. Within the next month the crosscut from the shaft should be under the point where high-grade ore was found on the surface and intercepted by the diamond drills. If this is confirmed by underground work it is possible that the dividend will not be cut immediately. Two substantial shipments of high-grade ore totaling 84 tons and averaging around 2,000 oz. to the ton have been shipped from the company's property in South Lorrain.

At the Cobalt Contact property, in Cobalt, there has been considerable improvement, and the mill heads are now averaging close to 40 oz. Additions are being made to the mill to permit finer grinding, to improve the extraction, and it is also expected that the mill capacity will be increased.

Barry-Hollinger's Monthly Rate of Production Improves

Barry-Hollinger production is now at the rate of approximately $40,000 a month, and the outlook for the future is considerably improved. Additions are being made to the mill which should raise the capacity from 100 to 200 tons a day. It is not expected, however, that the mill will be operated at the enlarged capacity for some time, but the additional tanks will allow a longer time for treatment and should improve extraction. The old Patricia shaft, which was the first one sunk on this property, is being pumped out. In the early days a small mill was built at this point, but straight amalgamation was used and the results were not profitable. The vein in the No. 1 shaft is quite narrow, but of good grade.

Johannesburg Letter

By John Watson
Special Correspondent

Promising Gold Strike Reported on the Umfurdzi River in Southern Rhodesia

Johannesburg, May 10—The following results of crushing for April from eighteen leading Rand gold mines have recently been published. The mines are arranged in the order of profits earned:

	Tons Crushed	Value or Revenue £	Costs per Ton s.	d.	Estimated Profit £
Government Areas	194,000	373,833	16	1.6	220,210
New Modder	129,000	295,083	18	10.2	173,517
Crown Mines	208,000	283,468	19	9.7	77,433
Modder Deep	42,700	96,320	15	6.0	63,161
New State Areas	68,000	125,648	21	1.5	54,665
Springs	60,700	116,690	21	6.4	51,337
Van Ryn Deep	63,500	106,130	17	10.7	50,254
Brakpan	73,000	131,440	22	3.5	50,064
Modder B	65,000	105,192	18	2.7	45,956
Geduld	79,500	110,440	16	9.0	43,769
Sub Nigel	19,000	.....	38	5.9	43,051
Randfontein	205,000	209,427	17	8.3	30,484
West Springs	47,500	74,824	19	7.4	28,246
Langlaagte Estate	76,500	97,636	20	7.1	20,061
City Deep	78,000	123,093	27	7.7	15,287
Cons. Main Reef	55,300	85,058	25	3.9	15,045
Modder East	55,000	73,950	22	6.2	12,041
Robinson Deep	69,500	.....	20	3.9	11,190

A promising new gold strike is reported in Southern Rhodesia on the Umfurdzi River, about twenty miles northwest of the Shamva mine. A Greek prospector found favorable indications and spent some months in following these up. Working on an outcrop, showing 4 dwt., he went down about 20 ft. and uncovered some gold nuggets. This discovery has led to much pegging of ground in the vicinity. A discovery of tin is also reported between Shamva and Simoona, where vigorous development is in progress. The tin occurs in large crystals in greisen. Local prospectors are searching for extensions of this formation. As yet no additional finds have been reported.

The annual meeting of Langlaagte Estate and Gold Mining Co., Ltd., was held in Johannesburg on May 5, with J. H. Crosby presiding. In 1926 the total ore crushed was 950,000 tons, an increase of 16,000 tons over the record for the previous year. There was a small improvement in the grade and a decrease in the assay value of the residues. The working costs showed a decrease of 9.6d. per ton, and the working profit for the year showed an increase of £65,155. Two dividends, totaling 12½ per cent, had absorbed £189,979. For miners' phthisis the company's liability on July 31 last was £280,524. The two retiring directors, Professor Lawn and J. H. Crosby, were re-elected.

At the annual meeting of the New Primrose Gold Mining Co., Ltd., it was announced that a dividend of 5 per cent had been paid last year. At the end of the year, the requisite three months' notice had been given to the government mining engineer of intention to close the mine. This notice expired on March 31, but the mine will be kept running as long as it is possible to do so without incurring loss.

Societies, Addresses, and Reports

Second Empire Mining and Metallurgical Congress Meets in Canada Aug. 22 to Sept. 28

Two Tours Planned to Principal Mining Centers of the Dominion—Constituent Institutions to Present Papers

THE SECOND triennial Empire Mining and Metallurgical Congress will be held in Canada from Aug. 22 to Sept. 28, the Canadian Institute of Mining and Metallurgy being the convening body. During the period two simultaneous tours in special trains will be made. Tour "A" will visit the principal mining centers of Ontario, Quebec, and western Canada. Tour "B" will travel through Ontario with Tour "A," and then examine the mining areas of Quebec, eastern Canada, and Newfoundland. Meetings and technical sessions will be held as follows: Aug. 22-23, at Montreal, Que.; Aug. 25-26, at Toronto, Ont.; Sept. 3-4, at Winnipeg, Man.; Sept. 9-10, at Sydney, N. S.; Sept. 14, at Vancouver, B. C.; Sept. 20, at Edmonton, Alta.

The entire program of papers to be presented has not as yet been arranged; the following Canadian articles, however, have been definitely announced:

"Asbestos Mining and Milling," by J. G. Ross; "Portland Cement in Canada," by W. A. Toohey; "Mining Coal Under the Sea, in Nova Scotia, With Notes on Comparable Operations Elsewhere," by F. W. Gray; "The Coal Industry in Western Canada," by Messrs. Robert Strachan, W. J. Dick, and R. J. Lee; "Canadian Copper and Its Production," by C. P. Browning; "The Development of Gold Mining in Canada," by George E. Cole; "Impact Resistance of Steel at Low Temperature," by A. E. Cameron; "Smelting Titaniferous Ores of Iron," by A. Stansfield; "The Cascade Method of Pouring Steel," by J. G. Morrow; "Lead and Zinc in Canada," by T. W. Bingay; "Magnesite," by G. M. Carrie; "Nickel, Past and Present," by R. C. Stanley; "Petroleum in Canada," by Messrs. W. A. Bell, R. B. Harkness, G. S. Hume, O. B. Hopkins, and S. J. Cook, with an introduction by John Ness; "The Silver Mining Industry in Canada," by A. A. Cole.

The ten constituent institutions composing the congress are: The Institute of Metals (London); the Institute of Mining Engineers (London); the Institution of Mining and Metallurgy (London); the Iron & Steel Institute, (London); the Institution of Petroleum Technologists (London); the Chemical, Metallurgical and Mining Society of South Africa; the South African Institution of Engineers; the Australian Institute of Mining & Metallurgy; the Mining and Geological Institute of India; and the Canadian Institute of Mining and Metallurgy.

Members of the American Institute of Mining and Metallurgical Engineers have been invited to attend the congress. Twenty-five reservations on Tour "A" and twenty-three on Tour "B" have been allocated by the congress for the use of Institute members who are not members of any of the ten constituent institutions composing the congress. The Institute requests that applications for these reservations be forwarded to the secretary at 239 West 39th St., New York City.

Engineering and Mining Journal will be represented at the congress by A. B. Parsons, associate editor, who will participate in Tour "A."

American Delegation Leaves for Stockholm Meeting

The American delegation to the Stockholm meeting of the International Chamber of Commerce, to be held June 27 to July 2, is made up of 150 leading business executives, representing different lines of industry, finance, and commerce. Owen D. Young, chairman of the board of the General Electric Co., is the chairman of the delegation, which sailed on the steamship "George Washington" on June 14. Special reports of the meeting, by E. J. Mehren, will appear in the *E. & M. J.*

Chemical, Metallurgical and Mining Society Meeting

At the monthly meeting of the Chemical, Metallurgical and Mining Society of South Africa held in Johannesburg on April 23, E. H. Johnson presented a paper on "Concentration and Selective Regrinding," describing recent practice and economies effected at the East Rand Proprietary Mines. Replies to discussions were also given.

Founder Societies Represented at Louvain Celebration

The University of Louvain has invited Engineering Foundation to participate in the celebration of the 500th anniversary of the founding of the University. The Foundation has responded on behalf of its founder societies and has designated as its delegate Dr. Edward Dean Adams, John Fritz Medalist, honorary member and former vice-chairman of the Foundation board. Dr. Adams has generously accepted this mission and will attend the ceremonies in Louvain on June 28 and 29.

As the delegate of this large body of 56,000 American engineers, Dr. Adams will carry to the University formal congratulations from each founder society, the library board and Engineering Foundation, handsomely bound together in a book. To the ancient library of the University of Louvain, destroyed at the beginning of the World War and recently restored, he will convey in handsome cases a set of yearbooks of the founder societies and a set of the publications of the Foundation. The University has an engineering department from which more than one graduate found his way to the United States. Among them was the late E. Gybbon Spilsbury, a president of the American Institute of Mining and Metallurgical Engineers, chairman of Engineering Societies library board, vice-president of United Engineering Society, and member of Engineering Foundation, who gave his services generously to the engineering societies.

M. & M. Society Sees "Movie" on Bolivian Tin Mining

Any impression that might have been entertained that the operations of the Patino Mines & Enterprises, largest producer of tin in Bolivia, are antiquated and still in the "llama" stage was dispelled by W. F. Kemble at the meeting of the New York Section of the Mining and Metallurgical Society of America held at the Harvard Club on June 9. Mr. Kemble's evidence was principally ocular: it consisted of five reels of excellent moving pictures. The first four showed operations in Bolivia and the last in the tin-smelting plant of Williams, Harvey & Co., Ltd., at Bootle, England, where the concentrates from the Patino mines are sent for smelting.

The annual election of officers for the section preceded the entertainment of the evening. Arthur Notman succeeds H. K. Masters as chairman; W. B. D. Motter, Jr., was selected as vice-chairman, and A. B. Parsons, secretary-treasurer.

Annual A.A.E. Convention Held at Tulsa

The thirteenth annual convention of the American Association of Engineers was held in Tulsa, Okla., on June 6, 7, and 8. The annual address was made by Charles J. Ullrich, president of the association. Other addresses were: "Mineral Resources of Oklahoma," by Charles N. Gould, State Geologist of Oklahoma; "Flood Control," by E. E. Blake; "The Engineer" by F. G. Johah. Colonel P. J. Hurley was the speaker of the evening at the annual banquet. In the course of the meetings Charles A. Lindbergh was made an honorary life member of the association. Congratulations of the association were cabled to Clarence D. Chamberlin.

Joplin-Miami Section Meeting

The regular monthly meeting of the Joplin-Miami section of the American Institute of Mining and Metallurgical Engineers was held at Bexter Springs, Kan., on May 31. The program was in charge of the geologists of the field. J. N. Thiel, director of the Joplin office of the Missouri geological survey, presided. The program included a talk on theories of ore deposition by J. S. Brown, of the Kansas Explorations Co.; a discussion of subnormal shale and its significance by Foster S. Naething; and a discussion of fractures or shear zones and their relation to the orebodies in the district by W. F. Netzeband, of the Eagle-Picher Lead Co.

Personal Notes

James W. Neill, mining engineer and metallurgist, has returned from Japan to his home in Pasadena, Calif., for the summer.

Sir Alex. R. Slater has been appointed Governor of the Gold Coast in succession to **Brigadier General Sir Gordon Guggisberg.**

Prof. Wilbert J. McBride, recently appointed to the chair of mining engineer at McGill University, has arrived at Montreal to enter upon his duties.

Dr. A. W. Rogers, Director of the Union Geological Survey, and **L. Nel**, Government Geologist, have left Pretoria for Capetown on official business.

K. Fletcher, of the Noranda, has been appointed consulting engineer of the recently formed **Newbec Mines, Ltd.**, operating in the Rouyn field of Quebec.

Donald McHardy, general manager of the Premier Diamond mine, in the Transvaal, with his daughter, is making an extended tour of the Union by motor car.

F. Le Roi Thurmond has been appointed mill superintendent for Duthie Mines, Ltd., at Smithers, B. C. This mill is using the selective flotation process.

Philip D. Wilson, mining engineer and geologist with the American Metal Co., Ltd., has returned to New York after a three months' trip on professional business in Cuba.

C. F. Williams, district mining supervisor of the U. S. Geological Survey, stationed at Miami, Okla., is in Washington for conference with officials of the office of Indian Affairs.

Dr. Samuel Evans presided at the recent annual meeting of the Crown Mines, Ltd., in Johannesburg and gave an interesting review of the position of the gold-mining industry.

F. W. Beyers, Minister of Mines of the Union of South Africa, recently visited Port Nolloth, where over £16,000,000 worth of copper has been taken out of Namaqualand since 1857.

Charles Spearman, consulting engineer of Montreal, has gone to make an inspection of the Selkirk Gold Mining Co.'s property at Kay Lake, in the Lake Winnipeg mining area of Manitoba.

J. B. Woodworth, of Vancouver, B. C., has taken over the Patterson gold property, at Porcher Island, 25 miles south of Prince Rupert. Operations will be started at once, the ore going direct to the Anyox smelter.

Arthur Lakes, of Nelson, B. C., is making an examination of the Molly Hughes mining property, at New Denver, B. C., which is under option to a Boston-New York syndicate represented by Kirby Thomas.

C. O. Schlereth has just returned to the United States from Laurium, Greece, where Edward and Kuno B. Heberlein are erecting a 200-ton flotation mill, an enterprise in which Mr. Schlereth is interested and in which he acts in a consulting capacity.

E. L. Sweeney, who recently completed a contract under the terms of which he constructed and brought into successful operation a flotation plant for the Central Copper Co., at Dos Cabezas, Ariz., on June 1 assumed the management of the property of the Sonora Development Co., at Congress, Ariz.

N. E. Giblin, manager of the Celebration mine, Hampton Plains, and formerly associated with some of the mines on the Edna May field, Western Australia, has been appointed superintendent of the Rosebery-Hercules-Mount Read group of mines, controlled by the Electrolytic Zinc Co. of Australia, on the West Coast of Tasmania.

Dr. J. B. Porter, of the faculty of applied science of McGill University, Montreal, was given a dinner by his colleagues on May 30, at which he was presented with a silver platter on the occasion of his retirement from the chair of mining engineering, which he had occupied for thirty years. The chair was occupied by **Dean H. M. Mackay** and the presentation was made by **Prof. C. M. McKergow.** Dr. Porter recently received the appointment of emeritus professor of mining engineering at McGill.

F. L. Ransome has resigned from the University of Arizona and accepted the professorship of economic geology at the California Institute of Technology, at Pasadena. The new position leaves about half of his time free for research and for consulting work in mining geology. He recently made an examination of the quicksilver properties of the Tonto Mining Co. and the Arizona Cinnabar Co. in the Mazatzal Mountains, Gila County, Ariz. Mr. Ransome has been engaged by the United Verde Extension Mining Co. to make a thorough study of the geology of that company's mine at Jerome, Ariz.

Guy C. Riddell, accompanied by Mrs. Riddell, has returned to New York from Central America. During the last three months his party penetrated remote mining and timber regions of Panama, in the examination of new manganese, iron, gold, copper, and mahogany properties. Mining concessions and water-power sites, as well as railroad outlet to the coast, were traversed and photographed by airplane. The concessions were covered as thoroughly as possible on foot, and later traversed by plane for alignment of data. Two army planes were used for the work over uncharted country, one carrying the photographic equipment, the other a convoy. A flight of five hours out of Panama City covered 450 miles of country in the interior.

Ernest E. Thum, metallurgical editor of *Chemical and Metallurgical Engineering* from 1917 to 1923, has joined the staff of *The Iron Age* as associate editor. Mr. Thum is a graduate of the Colorado School of Mines. From 1906 to 1914 he was connected with the Anaconda Copper Mining Co. in various professional capacities, being chief engineer at the Great Falls smelter in 1914, in which year he became professor of metallurgy at the University of Cincinnati, where he remained until 1917. Since leaving the McGraw-Hill organization Mr. Thum had been manager of the technical publicity department of the Linde Air Products Co. and associated subsidiaries of the Union Carbide & Carbon Corporation. His friends and associates in the field of technical journalism will be gratified that Mr. Thum has renewed his association with the publishing industry as a member of the staff of *The Iron Age*.

Obituary

Colonel H. G. L. Panchand died in Johannesburg on May 2. He was secretary of the Newmann group of mines until the death of Sigismund Newmann.

Thomas F. Coyne, a prominent operator of the Joplin-Miami district, died at his home at Webb City, Mo., on June 10. He was fifty-six years old, and had been connected with the mining industry since 1883. Mr. Coyne was one of the first presidents of the Tri-State branch of the American Zinc Institute.

F. R. "Mortabele" Thompson, a well-known South African and Rhodesian pioneer, died on May 3 at his farm near Barkly West. He was the first compound manager at De Beers, Kimberley, and later was secretary and interpreter to Cecil Rhodes. He was largely instrumental in getting the concession from Lobengula, which nearly cost Thompson his life.

F. Dean Bradley, a mining engineer of Nevada, who had for the last year been regional director for the federal bureau of vocational education for several Western states, died in Reno, Nev., on June 2. Mr. Bradley was well known in Nevada, where he graduated from the state university in 1905, and served his apprenticeship in the camps of Goldfield and Tonopah, finally leaving the active operating work to take charge of the Tonopah School of Mines. It was while engaged in this teaching work that he became interested in vocational training, with special reference to old or disabled miners, and the last few years of his life were devoted to this class of work. He leaves a wife and two children in Carson City.

Charles Francis King, seventy, a mining engineer, an author, art connoisseur, and some decades ago interested in many mining projects, was found dead in his apartment at 49 Prospect St., Brooklyn, on June 9. Though a wealthy man, the owner of securities and real estate, and, according to report, of an island "somewhere in the West Indies," Mr. King chose to live as a mystic and recluse, subsisting on less than a dollar a day, which he drew, daily as needed, from a savings bank. A wiry little man, attired in garments of the fashion of 1898, living in a neighborhood of factories and tenements, friendly with the policeman on his beat, but apparently estranged from kith and kin, the elderly engineer more resembled a character from Dickens or Balzac than the modern type of professional man. Some of the older generation of engineers may remember him. He was a Lehigh graduate—class of 1880—and a life member of the A.I.M.E.

Recent Technical Publications

Reviews, Abstracts, and References

An Outline of Careers. Edited by Edward L. Bernays. George H. Doran Co., New York City. Price, $5.

"What are you going to be when you grow up?" From the time a boy of four first hears this conversation-making query until he goes forth to make his way in the world, with or without a college education, the question of a career is an ever-present problem. The belief is growing that the question, by and large, is not answered as it ought to be in most instances. There are too many misfits. Too many good plumbers are spoiled by trying to make lawyers out of raw material that is not suitable. With the purpose of helping the boy and his advisers to select the kind of work for which he is fitted by temperment and natural ability, Edward L. Bernays has compiled a book to which thirty-eight specialists have contributed a chapter outlining the requirements of their particular profession or near-profession; how to embark upon it as a career; and what it may be expected to give in return. John Hays Hammond is the author of the chapter on "Engineering." Naturally, he sees the question through the eyes of the mining engineer, although he generously omits qualifying adjectives for the most part. He says:

"A career of this sort ought to be peculiarly broadening. An engineer is thrown into contact with almost every type of business and profession and into the comradeship of every condition of men. He is necessarily in co-operation with the business man—the capitalist, the promoter, the manufacturer, the merchant, the industrial and commercial man; on the other hand, he is close to the laborer at every turn. He must work with men of other professions; the lawyer who must instruct him as to mining laws; the architect with whom he may be in intimate collaboration; the physician who safeguards the health of his men; the newspaper man who keeps the public informed as to the importance and success of his particular undertakings; the chemist; the statistician; the politician; the economist; and, where he is in charge of a large community, the school teacher and the clergyman."

Mr. Hammond sees large opportunity for young men who are not afraid to work, and who have resourcefulness and intelligence, to accomplish as engineers something that will be worth while and at the same time give them a reasonable share of the good things of life.

Among the other chapters that are interesting are: Advertising, by Stanley Resor; Automobiles, by Roy D. Chapin; Banking, by Reeve Schley; Medicine, by Dr. Albert Allen Pusey; Science-applied, by Samuel R. Powers; Science-research, by Vernon B. Kellog; Transportation, by C. H. Markham; and Stage, by David Belasco. Among these and the thirty others that are discussed any young man ought to find the occupation for which he is best equipped. One possible disadvantage might be that if he read the whole book he would be so captivated by the splendid opportunities offered by many that he would be more than ever unable to make a choice. Nevertheless, we recommend the book. A. B. PARSONS.

Mineral Resources—The following separates of "Mineral Resources of the United States, 1924 and 1925" have recently been issued by the U. S. Bureau of Mines and may be obtained from the Superintendent of Documents, Washington, D. C., at the prices quoted: "Coal in 1924," pp. 131, by J. E. Black, L. Mann, and F. G. Tryon, 20c.; "Cement in 1925," pp. 25, by B. W. Bagley, 5c.; "Fuller's Earth in 1925," pp. 4, by Jefferson Middleton, 5c.; "Gold, Silver, Copper, Lead, and Zinc in New Mexico and Texas in 1925," pp. 15, by C. W. Henderson, 5c.; "Potash in 1925," pp. 9, by A. T. Coons, 5c.; "Stone in 1925," pp. 32, by A. T. Coons, 5c.; "Gold, Silver, Copper, Lead, and Zinc in California and Oregon in 1925," pp. 37, by James M. Hill, 10c.; "Silver, Copper, Lead, and Zinc in the Central States in 1925," pp. 35, by J. P. Dunlop and H. M. Meyer, 10c.; "Sand and Gravel in 1925," pp. 23, by E. R. Phillips, 5c.; "Silica in 1925," pp. 5, by Frank J. Katz, 5c.

Directory of Laboratories—Bureau of Standards Miscellaneous Publication No. 90 is entitled, "Directory of Commercial Testing and College Research Laboratories." The publication lists 207 commercial testing laboratories throughout the country, with the types of commodities they are prepared to test, and 143 colleges which do considerable research work. The publication is issued in anticipation of an increase in the demand for testing service in both domestic and export trade. Copies of the publication are obtainable for 15c. from the Superintendent of Documents, Washington, D. C.

Deep Mining—"Deep Level Mining and High Temperatures" is the subject of a 25-page paper by A. Mavrogordato and H. Pirow in *The Journal of The South African Institution of Engineers* for February. (Johannesburg; price 2s.). This is an inquiry into certain cases of sudden death presumably due to heat stroke, with a report on the associated conditions.

Gold-Coast Mining—The report of the Mines Department, Government of the Gold Coast, for the year ending March, 1926, was recently received. Gold, manganese, and diamonds were the principal mineral products. Copies may be obtained for 2s. each from the Crown Agents for the Colonies, 4, Millbank, London, S. W. 1., England.

Mine Sampling—Methods of mine sampling used by fifty-five mining companies, and suggestions as to standardization of mine sampling, are given by Guy N. Bjorge in the June number of the *Mining Congress Journal.*

Patents

Zinc Oxide Recovery—No. 1,628,952. May 17, 1927. J. F. Cregan, Pueblo, Colo., assignor to American Smelting & Refining Co., New York City. Consists of forming a zinc fume in a reverberatory furnace, subjecting the fume to a reducing atmosphere at a high temperature by adding thereto any excess of reducing gas, to reduce oxides formed during smelting, and then oxidizing the fume. Patent No. 1,628,953, issued to the same applicant and similarly assigned, covers a process for making zinc oxide in which the zinc oxide is produced directly from a zinc-bearing material. The material is smelted and the distilled zinc vapor passed to a settling chamber to settle out foreign material. The vapor is then mixed with air and conducted to a burning chamber, where combustion converts the zinc vapor to an oxide.

Oil Shale—No. 1,627,162. May 3, 1927. Gustav Egloff, Chicago, assignor to Universal Oil Products Co. of Chicago. A process for treating oil shale involving the vaporization of the volatiles in the shale and their subsequent condensation and collection. No. 1,627,163, issued to the same applicant and similarly assigned, covers a process of destructively distilling oil shale.

Sulphur Mining—No. 1,628,873. May 17, 1927. A. T. Drachenberg, Freeport, Tex. A process of subterranean sulphur mining using a liquid fusion system in which a heated fusion fluid is delivered to the sulphur deposit, a flow of mud-laden liquid discharged at a level above the sulphur deposit to confine the fusion to the sulphur zone, and the fused sulphur removed.

Drilling Appartus—No. 1,627,291. May 3, 1927. Norman Madsen, Michigan City, Ind., assignor to Sullivan Machinery Co. A rod clevis to be used in a lifting tool for drill rods. No. 1,627,539, similarly patented and assigned. A drilling apparatus equipped with a hydraulic feeding mechanism.

Molybdenum and Tungsten Oxides—No. 1,629,004. May 17, 1927. Paul Schwarzkopf, Berlin — Charlottenburg, Germany. A process for producing molybdenum trioxide and tungsten trioxide from their ores by melting the ore and evaporating the oxide from the ore while it is in the molten state.

Retort Furnace—No. 1,627,538. May 3, 1927. Aron M. Beam, Denver, Colo. Leroy J. Beam, administrator of Aron M. Beam, deceased. Design for a continuously operating ore or ore-shale converting retort furnace.

Flotation Reagent—No. 1,629,080. May 17, 1927. Frederick Laist and Frederick F. Frick, Anaconda, Mont. A process of concentrating ores by froth flotation using a sulphone in a quantity effective for flotation.

Concentrating Table—No. 1,627,157. May 3, 1927. James B. Dodds, Denver, Colo. A design for a table equipped to subject the deck to upwardly directed impulses by a fluid medium underneath the deck.

Grate for Ball Mills—No. 1,629,803. May 24, 1927. Frank Earl Marcy, San Diego, Calif. A design for a grate for ball mills.

Market and Financial News

McIntyre Porcupine Increases Output and Lowers Costs

Total Operating Expense $4.148—Ore Reserves Increased—New Shaft Nears Completion

ALTHOUGH the average grade of the ore milled during the nine-month period ended March 31, 1927, was 64c. lower than in the same period of the preceding year, gross income and profits of the McIntyre Porcupine Mines, Ltd., were at a higher rate. The fiscal year has been changed so as to end on March 31, which accounts for the report covering only nine months. Earnings for the nine months were $1,377,172, against $1,721,382 for the twelve. At the rate of the shorter period a full year would produce about $1,835,000, which gives a comparison of the results in the two periods.

In his report of operations R. J. Ennis, general manager, says that broken ore in the stopes amounts to 328,474 tons averaging $7.95, and estimates the total ore reserves at 1,675,898 tons averaging $8.43 per ton, for a gross value of $14,130,220. Production for nine months totaled 142,100 oz. of gold from 385,409 tons of ore averaging $8.08. Mr. Ennis reports that the big new shaft had reached the 4,131-ft. point in March, and that the work of finishing stations and ore pockets and installing equipment is progressing rapidly. The hoisting machinery and the headframe will be ready so that the entire plant can be operated in August. The accompanying tables summarize the financial results for the nine-month period.

McIntyre Profit-and-Loss Statement, July 1, 1926 to March 31, 1927

Earnings			
Bullion recovery			$2,957,060.97
Operating costs			
Mining and development	$1,074,612.26		
Crushing and conveying	52,497.57		
Milling	288,738.24		
Miscellaneous camp costs	44,883.05		
		$1,460,731.12	
Administrative and general expense			
Management and general expense—mine	$56,721.48		
Administrative and general expense—head office	62,937.74		
Transfer, registrar and stock issue expense	5,196.10		
Insurance	13,098.57		
		137,953.89	
Total operating costs before providing for taxes and depreciation			1,598,685.01
Operating profit before providing for taxes and depreciation			$1,358,375.96
Non-operating revenues:			
Interest, exchange and discounts earned		$72,263.46	
Miscellaneous earnings		5,206.56	
			77,470.02
			$1,435,845.98
Appropriations			
Provision for municipal, provincial and dominion taxes for current nine-month period			58,673.19
Net profit for the nine-month period before depreciation provision, transferred to surplus account			$1,377,172.79

McIntyre Operating Costs per Ton

Mining	
Exploration	$0.0732
Development	.7010
Breaking and stoping	1.9916
Examination of prospects	.0224
	$2.7882
Crushing and transportation	$0.1362
Milling	.7492
Heating and maintenance	.0902
Mercantile store and welfare expenses	.0262
Management, bullion marketing and general expense—mine office	.1472
Administration and general expense—head office	.1763
Insurance, general	.0345
	$4.1480

Quicksilver producers in California are now filling flasks—quicksilver flasks—with a unit quantity of 76 lb. 1 oz. per flask, to correspond with foreign practice. The standard heretofore has been 75 lb.

U. S. Copper Consumption in 1926 Broke All Records

On the average each person in the United States "used" 15.31 lb. of copper during 1926, compared with 14.54 lb. in 1925, with 13.50 lb. in 1924, and only 8.49 lb. in 1921. The consumption in both 1919 and 1920 was greater than in 1921, however. These estimates are made by the American Bureau of Metal Statistics and are published in the 1926 Year Book, just off the press.

The figures in the accompanying table are derived from reports of consumers and include secondary metal as well as virgin production. In the last seven years the Bureau estimates that total manufactures have taken 4,913,283 tons of copper, whereas deliveries during the same period were 4,753,481. The apparent discrepancy is accounted for in large part by the use of secondary metal.

Santa Gertrudis Co., Ltd., during the first quarter of 1927 milled 184,470 tons of ore, from which a net revenue was realized amounting to $457,155 before deducting anything for depletion and depreciation reserves. The average price for which silver was sold was 56.32c. per ounce.

Estimated Consumption of Copper in the United States

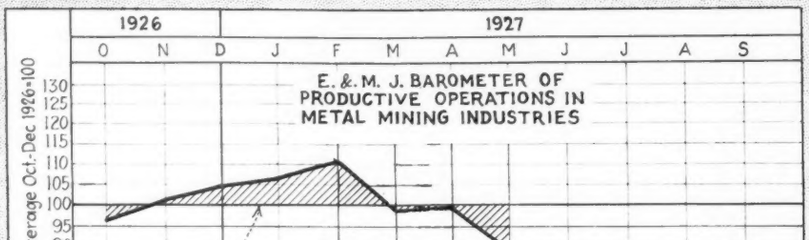
In Tons of 2,000 Pounds

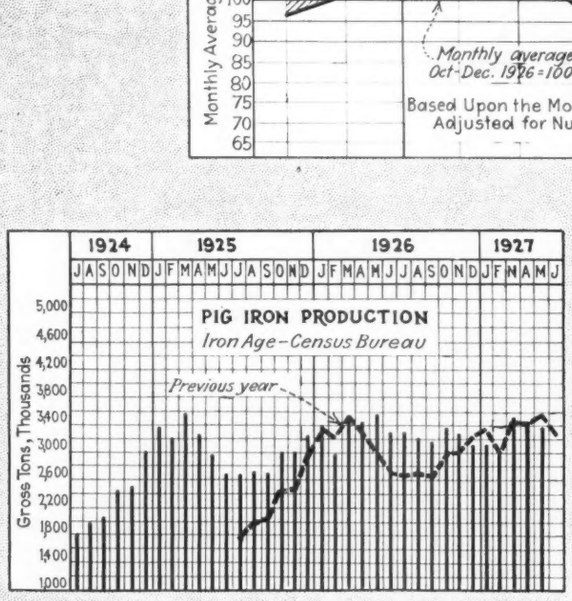
	1919	1925	1926
Electrical manufactures (a)	142,000	183,500	201,000
Telephones and telegraphs	40,500	86,000	90,000
Light and power lines (b)	27,250	110,000	117,000
Trolley wire	4,300	6,650	7,000
Wire and rods, n.e.s. (f)	32,000	63,000	74,000
Wire cloth	3,000	5,700	7,000
Steam railways electrified	125	1,000	400
Automobiles (c)	48,500	106,400	102,800
Automobile brake lining	450	1,500	1,700
Buildings (d)	30,600	46,700	50,200
Locomotives	5,175	2,200	2,900
Railway cars	8,385	7,150	6,150
Air brakes	2,950	2,000	2,000
Ships, commercial (d)	51,000	2,100	2,100
Ships, naval (d)	11,250	800	400
Bearings and bushings	40,000	35,000	38,000
Valves and pipe fittings	20,000	24,100	26,000
Ammunition	11,500	5,900	5,700
Lubricators	3,150	6,000	5,000
Condensers	3,000	1,550	2,000
Fire-fighting apparatus	2,200	3,100	2,700
Agricultural machinery	500	650	1,100
Cash registers	650	450	400
Copper-bearing steel	1,150	1,200	1,350
Coinage	1,038	900	950
Radio receiving	.....	4,000	5,000
Clocks and watches (g)	.....	4,200	4,500
Washing machines (d) (g)	.....	3,650	4,700
Water heaters, household (g)	.....	3,600	4,000
Water meters (g)	.....	3,500	3,750
Refrigerators, electric (d) (g)	.....	7,900	15,000
Plated ware (g)	.....	7,300	8,000
Safety razors (g)	.....	.....	2,200
Radiators, heating	.....	.....	700
Other uses (f)	31,000	42,000	45,000
Manufacturers for export (e)	99,700	56,300	49,900
	21,373	836,000	890,600

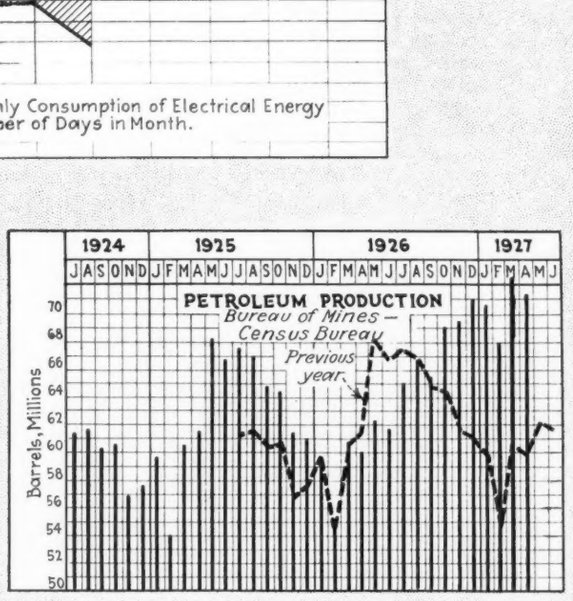
(a) Generators, motors, switchboards, lamps not including telephone and telegraph purposes. (b) Transmissions and distribution wire and bus bars. (c) Not including electrical manufactures. (d) Not including motors. (e) All primary fabrications copper and alloys. (f) Largely conjectural. (g) Included in other uses in prior years.

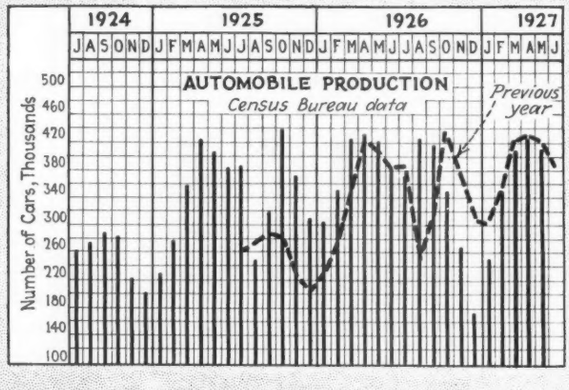
Indicators of Industrial Activity

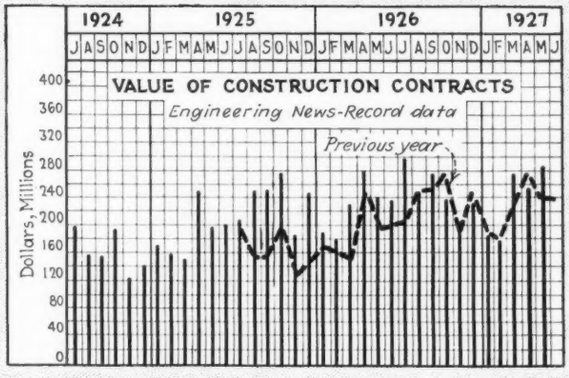
of Significance to Mining

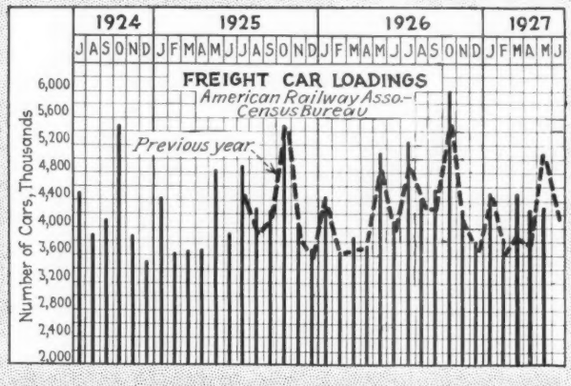

1926
1927
O N D J F M A M J J A S
E. & M. J. BAROMETER OF PRODUCTIVE OPERATIONS IN METAL MINING INDUSTRIES
Monthly Average Oct.-Dec. 1926=100
130 125 120 115 110 105 100 95 90 85 80 75 70 65
Monthly average Oct.-Dec. 1926=100
Based Upon the Monthly Consumption of Electrical Energy Adjusted for Number of Days in Month.

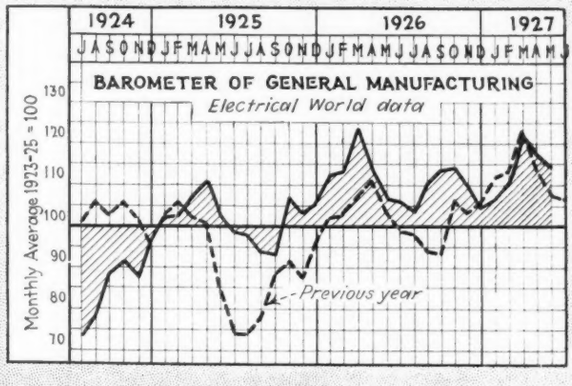

1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
PIG IRON PRODUCTION
Iron Age—Census Bureau
Previous year
Gross Tons, Thousands
5,000 4,600 4,200 3,800 3,400 3,000 2,600 2,200 1,800 1,400 1,000


1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
PETROLEUM PRODUCTION
Bureau of Mines—Census Bureau
Previous year
Barrels, Millions
70 68 66 64 62 60 58 56 54 52 50


1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
AUTOMOBILE PRODUCTION
Census Bureau data
Previous year
Number of Cars, Thousands
500 460 420 380 340 300 260 220 180 140 100


1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
VALUE OF CONSTRUCTION CONTRACTS
Engineering News-Record data
Previous year
Dollars, Millions
400 360 320 280 240 200 160 120 80 40 0


1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
FREIGHT CAR LOADINGS
American Railway Asso.—Census Bureau
Previous year
Number of Cars, Thousands
6,000 5,600 5,200 4,800 4,400 4,000 3,600 3,200 2,800 2,400 2,000


1924 1925 1926 1927
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
BAROMETER OF GENERAL MANUFACTURING
Electrical World data
Previous year
Monthly Average 1923-25 = 100
130 120 110 100 90 80 70

The Market Report

Lower Prices for All Metals—Buying Small Except in Lead—Copper Dead

New York, June 15, 1927 — Lower prices characterize the domestic markets for all of the non-ferrous metals. Activity in lead has been well up to the average at prices only fractionally lower than a week ago. Zinc has been comparatively quiet, closing the week at 6.25c., St. Louis. Tin has been moderately active, with prices off about ½c.; and the copper market has been virtually dead, such sales as have been made in the last two days being at 12.50c., delivered in the East. Quicksilver and antimony prices are lower, whereas platinum is practically unchanged. Silver has fluctuated within narrow limits, being quoted at 57c. today.

Copper at 12.50c.

Buying of copper has been practically non-existent, the aggregate sales being as low as any week in the last two years at least. Last Thursday two sales were made at 12.725c. in Connecticut, and subsequently several small orders were placed at as high as 13c. delivered in the Middle West. However, the only sales of consequence since Saturday have brought only 12.50c. for Connecticut delivery. Buyers, presumably, have been awaiting the appearance of the May statistics, which have just been issued. The interpretation of the figures will depend largely on the interpreter — whether he be a buyer or a seller. The rate of production is slightly smaller and foreign shipments have increased. However, the decline in domestic deliveries more than offset both of these factors, resulting in a net increase of about 10,000 tons in stocks. Many observers feel that a crisis is approaching in the copper industry and that some definite developments are due.

Daily Prices of Metals

June	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
9	12 50	63 75	67 75	6.40@6.45	6.175@6.25	6 20@6 225
10	12 475	64.00	67 875	6.40@6 45	6 15	6.20
11	12 425	64 00	67 875	6.40	6.15	6 20
13	12.30	64 00	68.00	6 40	6.15	6.20
14	12 275	64 00	67 75	6.40	6 15	6.275@6.30
15	12.275	63 625	67 50	6.40	6.15	6 25
	12.375	63 896	67 792	6 408	6 160	6 225

Average prices for calendar week ending June 11, 1927, are: Copper, 12.492c.; 99 per cent tin, 63.958c.; Straits, 67.938c.; N. Y. lead, 6.429c.; St. L. lead, 6.181c.; zinc, 6.238c.; and silver, 56.958c.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
9	54	54⅝	59¾	293½	286½	24 11/16	25	28 11/16	28¾
10	53 13/16	54 9/16	59¾	294⅜	287	24½	24 13/16	28 11/16	28 11/16
13	54 1/16	54 11/16	60	295	286⅞	24 7/16	24¾	28 11/16	28⅝
14	54½	55⅛	60¼	294⅞	286⅝	24 9/16	24⅞	29 1/16	28 15/16
15	54	54⅝	60	293	285⅛	24 7/16	24¾	29	28⅞

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June	Sterling Exchange "Checks"	Silver		Gold London	June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
9	4.85¼	57¼	26⅜	84s11½d	13	4 85¼	57¼	26⅜	84s11½d
10	4.85¼	57	26 5/16	84s11½d	14	4 85¼	57	26 5/16	84s11d
11	4.85¼	57	26⅜	.....	15	4 85¼	57	26¼	84s11½d
					Avg.		57.063		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forencon. Cables command one-half cent premium.

Little Change in Zinc

With the volume of buying somewhat less than the average, zinc prices have ranged between 6.20c. and 6.30c. during the week, the closing price, 6.25c., being slightly lower than a week ago. Production in Joplin continues at about 10,000 tons per month, but producers are holding their concentrate, and in the last few days about 3,500 tons brought $40, although the price is nominally $39. Statistics issued by the American Zinc Institute in tons of 2,000 lb. show the following:

Stock, May 1	41,208
Produced	51,296
	92,504
Shipped	50,458
Stock, May 31	42,046
Shipped from plant for export.	4,898
Total retort capacity at end of period	136,844
Number of idle retorts available within sixty days	53,749
Average number of retorts operating during period	79,846
Number of retorts operating at end of period	78,057

Lead Activity Decreases

Following the extreme activity of a week ago, the lead market has been quieter, but still a good business has been booked. The American Smelting & Refining Co. has all along maintained its contract price at 6.40c., New York, since May 26. On Thursday and Friday some business was done at 5 or 10 points' premium over this level, but in the last few days sellers have been unable to get any more than the Smelting company's price except for special lots. Forward lead sold as high as 6¼c., St. Louis, on Thursday, and a good tonnage was also booked at 6.225c. Some sellers, however, were willing to book lead for delivery up to the end of July at no more than 6.175c. on that day. Practically all of the business, beginning with Friday, has gone at 6.15c., St. Louis.

Most of the business has been for June, but there has been a good inquiry for July also and an occasional order for August. Corroding grades command premiums of $2@$3.50 per ton, depending on brand and delivery point. Desilverized is somewhat scarcer than chemical lead in the Middle West, and there is an inclination to quote far-forward shipment higher than June or July.

Tin a Trifle Lower

The tin market has not been active, though a good business on July and August deliveries was done with consumers yesterday. Prices are slightly lower, ranging, for the most part, between 67¼ and 68c. on prompt Straits during the week, with August from 3 to 3¼c. lower.

Foreign Exchanges Firm

Closing cable quotations on the principal foreign exchanges on Tuesday, June 14, showed little change from a week ago: francs, 3.91⅝c.; lire, 5.58c.; and marks, 23.695c. Canadian dollars, ½ per cent discount.

Silver Quiet and Steady

The silver market has continued quiet during the week and fluctuated within narrow limits. While buying for China account has been the chief support of the local market, reports from abroad state that China has both bought and sold there. India has shown little interest in the market.

Mexican Dollars (old Mexican pesos): June 9th, 43⅜c.; 10th and 11th, 43¼c.; 13th, 14th, and 15th, 43½c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

Aluminum—Per lb., 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c. London, 98 per cent, £104@£106 per long ton for domestic consumption. Heavy imports unsettle British market.

Antimony—Per lb., duty paid, New York: Chinese brands, range for the week, spot business at 12⅝@12¼c. July arrival about ⅛c. higher. Cookson's "C" grade, spot, 18c. Market dull. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

Bismuth—Per lb., New York, in ton lots, $2.20@$2.25. London, 8s.

Cadmium—Per lb., New York, 60c. London, 1s. 10d. for Australian metal.

Iridium—Per oz., $109@$112 for 98 @99 per cent sponge and powder.

Nickel—Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal. London, £170@£175 per long ton, according to quantity.

Palladium—Per oz., $54@$56. Small lots bring up to $60. Pure metal as a constituent of crude platinum, nominal.

Platinum—Official price quoted by the leading interest on small miscellaneous orders for refined metal, $72. Open market cash sales of large lots, in New York, $66@$68. Apparently the tone is better for the moment at least. Pure metal as a constituent of crude platinum, nominal at $62.

London, £14½ per oz. for refined and £13½ for crude. Nominal.

Quicksilver—Per 75-lb. flask, $115@ $117. Dull and easier. Resale lots at lower price. San Francisco, $117.33. London, £22⅜@£23.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of June 4.

Zinc Blende Price Higher—Lead Ore Unchanged

Joplin, Mo., June 11, 1927

Blende

High	$42.60
Premium Blende, basis 60 per cent zinc	$40.00@ 41.00
Prime Western, basis 60 per cent zinc	39.00@ 40.00
Fines and slimes, basis 60 per cent zinc	36.00@ 38.00
Average settling price, all zinc	36.87

Galena

High	$82.70
Basis 80 per cent lead	78.00
Average settling price, all lead	81.57

Shipments for the week: Blende, 6,853; lead, 1,531 tons. Value of shipments for the week, $377,560.

Prime Western price offerings were advanced to a $40 basis by two buyers today, one of these taking all ore available and for sale at this figure. Sellers generally are declining to dispose of ore on the present market and are holding 33,000 tons for further advanced offerings. Buyers were able to secure only 6,230 tons. With the output at 9,370 tons and shipments at 6.850 tons there is added 2,520 tons to the stock. An output of 9,370 tons is a restriction of 50 per cent from peak production, or approximately 40 per cent less than the average last year. Cost of production for April was estimated by the Tri-State Zinc and Lead Ore Producers' Association at $44.88 per ton of concentrates. Producers of lead can still produce and sell on a small profit, but those holding zinc are also holding the lead for a higher market.

Platteville, Wis., June 6, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$41.75
Lead Ore	
Lead, basis 80 per cent lead	$80.00

Shipments for the week: Blende, 1,190 tons; lead, none. Shipments for the year: Blende, 29,999; lead, 840 tons. Shipments for the week to separating plants, 3,046 tons blende.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@ 40c. Business dull. Chemical grades unchanged from quotations in the June 4 issue.

Tungsten Ore—Per unit of WO_3, N. Y.; Wolframite, $10.50; Western scheelite, $11. Dull; prices nominal with weaker tendency.

Chrome, Iron, Molydenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the June 4 issue

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the June 4 issue.

Mineral Products

Arsenious Oxide (White Arsenic)—3¾c. per lb. Quiet. London, Cornish white, per long ton, £16.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate and Zinc Oxide are unchanged from prices in the June 4 issue.

Ferro-Alloys

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4@6 per cent carbon, 11½c.

Ferromanganese—Domestic and foreign, 78@82 per cent, $90 per long ton, furnace or duty paid. Consumers well covered for early needs. Spiegeleisen, 19@21 per cent, $36@$37, f.o.b. furnace; 16@19 per cent, $34.

Ferrotungsten—96@98c. per lb. of W contained, f.o.b. works. Market very dull.

Ferrocerium, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from prices in the June 4 issue.

Metal Products

Rolled Copper—Sheets, 21½c.; wire, 14⅝@14¾c. f.o.b. mill.

Lead Sheets—Full rolled, 10c. per lb.; clipped, 10½c.

Nickel Silver—28⅜c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Dimension sheets, 18⅜c. per lb.; rods, 15⅜c.

Zinc Sheets—9¾c. per lb., f.o.b. mill.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the June 4 issue.

Steel Prices Hold

Pittsburgh, June 14, 1927

The steel market appears to be decidedly more quiet than a fortnight ago, but appearances of quietness late in April and the fore part of May proved deceptive, May production of ingots being larger than would comport with such appearances. Production, at 4,046,214 tons, was only 2 per cent under that of April and ran 3 per cent above that of May, 1926.

Steel prices continue showing various irregularities, but they are no easier in the past two or three weeks and are holding better than might have been expected. Sheets are quite steady.

Pig Iron.—Sales of Valley iron have been light, but more activity is now expected as old orders finally play out. Consumption has been running distinctly light. Bessemer, $19; basic, $18; foundry, $18.50.

Connellsville Coke.—The spot market is steadier at former quotations, $2.85 @$3 for furnace coke and $4@$4.75 for foundry coke. A few third-quarter furnace coke contracts are to be made, and slight concessions are likely from the $3.50 second-quarter figure.

Freight Rates on Metals, Ores, and Concentrates

Carload Lots

Copper Bullion and Refined Copper

From	To	Rate per Ton of 2,000 Lb. All Rail	Via Gulf
El Paso, Tex.	Baltimore, Md.	$11.40	$9.40
Garfield, Utah	Perth Amboy	12.50	.....
Garfield, Utah	San Francisco	5.85	.....
Hayden, Ariz.	Perth Amboy	14.50	12.50
Miami, Ariz.	Perth Amboy	14.50	12.50
Anaconda, Mont.	Perth Amboy	12.50	.....
Butte, Mont.	Perth Amboy	12.50	.....
Humboldt, Ariz.	Chrome, N. J.	14.50	12.50
Douglas, Ariz.	Perth Amboy	14.50	12.50
Globe, Ariz.	Perth Amboy	14.50	12.50
Clifton, Ariz.	Perth Amboy	14.50	12.50
Clarkdale, Ariz.	Chrome, N. J.	14.50	12.50
Copperhill, Tenn.	Laurel Hill, N. Y.	$10.80	.....
Tooele, Utah	Chrome, N. J.	12.50	.....
McGill, Nev.	Baltimore, Md.	12.90	.....
Houghton, Mich.	New York	9.60	.....
Hancock, Mich.	New York	9.60	.....
Hubbell, Mich.	New York	9.60	.....
Dollar Bay, Mich.	New York	9.60	.....
Anaconda, Mont.	Tacoma, Wash.	7.09	.....
Ajo, Ariz.	New York	14.50	$12.50

Marine Conference Freight Rates

New York to

Hamburg	$6.50	per gross ton copper and lead
Liverpool	6.50	per gross ton copper and lead
Antwerp	6.00	per gross ton copper and lead
Havre	5.50	per gross ton lead
	5.75	per gross ton copper

Gulf ports to

Hamburg	$5.00	per gross ton copper, lead and zinc
Liverpool	5.50	
Antwerp	4.50	
Havre	5.25	

Pacific coast ports to

Hongkong	$5 00	per short ton copper and lead
Kobe	5.00	per short ton copper and lead

Lead Bullion (Pig Lead Where Shown)

From	Rates per Ton of 2,000 Lb. To New York	To St. Louis
East St. Louis, Ill.	$7.00	.....
Pueblo, Colo.	12.50	$9.00
Leadville, Colo.	12.50	9.00
East Helena, Mont	12.50	9.50
El Paso, Tex.	10.00 Via Gulf	
	12.00 All Rail	7.00
Omaha, Neb.	9.60	3.65
Murray, Utah	12.50	9.00
Midvale, Utah	12.50	9.00
Tooele, Utah	12.50	9.00
East Chicago, Ill.	6.40	(a) 1.60
Kellogg, Idaho	13.50	9.50
Carnegie, Pa.	3.80	(a) 5.00
Selby, Calif.	(b) 6.00	.....
Herculaneum, Mo.	(a) 8.80	(a) 1.80
Federal, Ill.	7.00	(a) 1.80
Collinsville, Ill.	7.00	(a) .75½
Granby, Mo.	(a) 10.50	(a) 3.50
Joplin, Mo.	(a) 10.50	(a) 3.50

(a) Pig lead only.
(b) Conference rate, via canal.

Slab Zinc

From	Rates per Net Ton to E.St. Louis	New York
Donora, Pa.	(a) $4.60	$3.80
Langeloth, Pa.	(a) 4.60	3.80
Palmerton, Pa.	7.10	3.00
Hillsboro, Ill.	1.40	7.00
Danville, Ill.	1.60	6.40
La Salle, Ill.	1.60	6.70
Springfield, Ill.	3.00	7.00
Cleveland, Ohio	5.80	5.00
Moundsville, W. Va.	4.40	3.80
Van Buren, Ark.	3.80	10.80
Fort Smith, Ark.	3.80	10.80
Bartlesville, Okla.	3.50	10.50
Blackwell, Okla.	3.80	10.80
Henryetta, Okla.	3.80	10.80
Sand Springs, Okla.	3.80	10.80
Cherryvale, Kan.	3.50	10.50
Black Eagle, Mont.	9.40	12.50
Park City, Utah	9.00	12.50
Amarillo, Tex.	5.80	12.80

(a) To St. Louis, Mo.

Zinc Ores and Concentrates

To	From	Rate per Net Ton
Bartlesville, Okla.	Altoona, Kan.	$2.10
	Pittsburg, Kan.	1.09
	Galena, Kan.	1.30
	Joplin, Mo.	1.40
	Iola, Kan.	1.09
	Baxter, Kan.	1.50
	Miami, Okla.	1.40
	Quapaw, Okla.	1.40
	Kansas City, Mo.	1.60
Sand Springs, Okla.	Miami, Okla.	2.20
	Quapaw, Okla.	2.20
	Galena, Kan.	1.50
	Joplin, Mo.	1.50
	Iola, Kan.	2.40
Dewar, Okla.	Cave Springs, Mo.	2.00
Kusa, Okla.	Cent City Spur, Mo.	2.00
Henryetta, Okla.	Chitwood, Mo.	2.00
	Galena, Kan.	1.50
La Harpe, Kan.	Mound City, Kan.	.50
	Oswego, Kan.	.50
	Parsons, Kan.	.50
Coffeyville, Kan.	Galena, Kan.	1.10
	Joplin, Mo.	1.22
Bartlesville, Okla. (a)	Baxter, Kan.	1.80
	Miami, Okla.	1.80
	Quapaw, Okla.	1.80

(a) Lead ore and concentrates.

Rates on Ores and Concentrates

From	To	Value of Product $5	$10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate														
Butte, Mont.	Anaconda, Mont.	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	22	.22	.22	.22
Butte, Mont.	Black Eagle, Mont. (a)	....	....	.....	.....	.....	.....	.....	1.01	.....	.....	.....	.....	.....	.....	1.01
Great Falls, Mont.	Helena, Mont.	....	....	1.50	....	1.69	....	1.91	....	2.36	....	....	....	....	....	2.48
Butte, Mont.	East Helena, Mont.	....	....	1.17	....	1.46	....	1.69	....	2.03	.....	.....	.....	.....	.....	2.14
Paxton, Calif.	Salt Lake Smelters, Utah	....	....	....	....	.....	.....	.....	.....	5 50	6.00	6.70	....	7.40	8.10	8.8
Johannesburg, Calif.	Selby, Calif.	....	....	.....	2.90	....	3.50	....	4.10	4.70	5.30	5.90	....	6.50	6.80	7.10
Johannesburg, Calif.	Humboldt, Ariz.	....	....	.....	3.40	....	4.10	....	4.80	5.50	6.20	6.90	....	7.60	8.00	8.30
Pioche, Nev.	Humboldt, Ariz.	....	....	7.74	....	8.55	....	9.36	....	9.99	.....	.....	11.25	....	....	12.42
Creede, Colo.	Durango, Colo.	....	....	3.25	3.50	3.75	4.00	....	4.25	4.75	5.25	5.75	6.05	....	....	7.10
Ouray, Colo.	Durango, Colo.	....	....	4.30	4.80	....	5.05	....	5.50	5.90	....	6.30	....	....	....	7.70
Telluride, Colo.	Durango, Colo	....	....	....	4.00	....	4.30	....	4.60	5 10	5.60	6.1	....	6.50	7.00	7.50
Silverton, Colo.	Durango, Colo	....	....	1.40	1 40	....	....	2.20	....	....	....	....	....	2.30	2.55	2.80
Tyrone, N. M.	Douglas, Ariz.	....	....	1.60	2.30	....	2.60	....	2.90	3 20	....	..	3 80	....	....	4.40
Tyrone, N. M.	El Paso, Tex.	....	....	1.40	1.70	....	2.00	....	2.30	2 60	....	..	3.20	....	....	3.80
Lordsburg, N. M.	Douglas, Ariz.	....	1.00	1.30	1 70	....	2.00	....	2.30	2 60	....	....	3.20	....	....	3.80
Lordsburg, N. M.	El Paso, Tex.	....	1.00	1.30	1.80	....	2.10	....	2.40	2.70	....	....	3.30	....	....	3.90
Tombstone, Ariz.	Douglas, Ariz.	....	....	.60	1.30	.90	1.60	....	1.90	2.20	....	....	2.80	....	....	3.40
Tombstone, Ariz.	El Paso, Tex.	....	1.60	1.90	....	2.50	....	....	3.50	3.80	....	....	4.40	....	....	5.00
Ray Junction, Ariz.	Hayden, Ariz.	....	.10	....	.40	....	.50	....	.80	.90	....	....	1.00	....	....	1.10
Sandon, B. C. / Alamo Concentrator, B. C.	Tadanac, B. C.	1.50	1.60	1.70	1.90	2.00	2.50	....	2.60	2 90	3.40	3.50	....	3.70	3.80	3.90
Rossland, B. C.	Tadanac, B. C.	.90	.90	1.00	1.00	1.10	1.50	....	1.60	1.60	1.60	1.70	....	1.70	1.70	1.70
Rossland, B. C.	Tadanac, B. C.(d)	.30	.30	.30	.30	.50	.70	....	.80	.80	.....	.....	.....	.....	.....	.....
Republic, Wash.	Tadanac, B. C.	....	2.11	2.56	2.66	2.86	3.84	....	3.84	3.84	4.69	4.89	....	5.19	5.39	5.59

(a) Minimum tonnage of 200 tons per day. (b) In open cars, minimum 80,000 lb. (c) Plus $2.70 per car switching.
(d) Applicable on ore only when shipped in trainload lots of not less than 10 cars and exclusive of switching charges at Rossland.

From	To	Value of Ores and Concentrates $10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate													
Burke, Idaho (a) (c)	Bradley, Idaho	....	....	....	....	....	....	....	....	.68	....	.....	....	.....	1.02
Burke and Wallace, Idaho	East Helena, Mont.	....	....	....	....	3.00	....	3.25	3.50	3.75	4.00	.....	4.25	4.50	4.75
Sagel, Idaho	East Helena, Mont.	....	....	....	3.38	....	3.83	....	4.16	....	....	.....	....	.....	4.84
Arizona Tunnel, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	....	.35	....	.....	....	.....	.50
Bayview, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	3.75	....	....	4.37½	....	.....	5.12
Park City, Utah	Salt Lake Smelters	1.00(c)	1.10	1.25	....	1.50	....	1.75	....	2.00	....	.....	2.25	.....	2.50
Eureka, Utah	Salt Lake Smelters	1.00	1.10	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Tintic, Utah	Salt Lake Smelters	1.00	1.10	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
St. Johns, Utah	Salt Lake Smelters	1.00	1.10	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Ophir, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Bingham, Utah	Garfield, Utah	....	.40	....	.75	....	....	....	.95	....	....	1.10	....	.....	1.25
Cherry Creek, Nev.	Garfield, Utah (c)	....	....	4.60	....	5.10	....	5.60	6.10	6.60	7.10	.....	7.60	8.10	8.60
Cherry Creek, Nev.	Garfield, Utah (c)	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	.....	.....
Goldfield, Nev.	Salt Lake Smelters	....	4.15	5.10	....	5.80	....	6.50	7.20	7.90	8.60	.....	9.30	10.00	10.70
Battle Mountain(a)	Salt Lake Smelters	....	....	3.20	....	3.80	....	4.40	5.00	5.60	6.20	.....	6.80	7.40	8.00
Palisade, Nev. (a)	Salt Lake Smelters	2.20	2.60	3.20	....	3.80	....	4.30	4.80	5.30	5.80	.....	6.30	6.80	7.30
Mina, Nev. (a)	Salt Lake Smelters	....	....	3.60	....	4.30	....	5.00	5.70	6.40	7.10	.....	7.80	8.50	9.20
Lovelock, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Golconda, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Hazen, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Tonopah, Nev.	Salt Lake Smelters	....	4.15	5.10	....	5.80	....	6.50	7.20	7.90	8.60	.....	9.30	10.00	10.00
Rogerson, Idaho	Salt Lake Smelters	2.50	2.75	3.50	....	4.00	....	4.50	5.00	5.50	6.00	.....	6.50	7.00	7.07
Georgetown, Colo.	Leadville, Colo.	....	....	3.50	....	3.75	....	4.00	5.00	5.00	5.80	.....	5.80	5.80	5.85

(a) Minimum weight, marked capacity of car used, but not less than 80,000 lb. (b) Minimum weight, 80,000 lb. (c) Minimum weight, 40,000 lb.
(d) Crude ore for concentration, 30c. per ton.
(e) For $9 value rate is 95c.; $8 values, 90c.; $7 value, 85c.; $6 value, 80c.

Mining Stocks—Week Ended June 11, 1927

Stock	Exch.	High	Low	Last		Last	Div.
COPPER							
Anaconda	New York	45¾	45	45¼	Ap.16,May21	Q	0.75
Arcadian Consol.	Boston	*45	*30	*30			
Ariz. Com'l	Boston	6½	5⅞	5⅞	Ja. 7, Ja. 28		0.50
Calaveras	N. Y. Curb	1¼	1⅛	1⅛			
Calumet & Arizona	New York	67	66¼	66¼	Ju. 13, Ju. 20	Q	1.50
Calumet & Hecla	Boston	15½	15	15¼	My.31, Jn.15	Q	0.50
Cerro de Pasco	New York	60	59½	60	Ap. 14, My. 2	Q	1.00
Chile Copper	New York	35½	35	35⅛	Jn.3, Jn.30,	Q	0.62½
Con. Coppermines	N. Y. Curb	2⅞	2⅜	2⅜			
Copper Range	Boston	13½	12¼	12⅝	Ap.2, My.2,	A	1.00
Crystal Copper	Boston Curb	*53	*32	*51			
East Butte	Boston	2	1¾	2	Dec., 1919		0.50
Granby Consol	New York	40⅜	39	39¼	Jn.15 Jy. 1	Q	1.00
Greene-Cananea	New York	47¼	45	45½	Nov., 1920		0.50
Howe Sound	New York	38⅛	36½	37⅜	Apr.1,Apr.15	Q	1.00
Inspiration Consol	New York	15	14½	14¾	Ma.17, Ap.4,	Q	0.25
Iron Cap	Boston Curb	2¼	2⅛	2⅛			
Isle Royale	Boston	10½	10	10⅛	Fe.4, Fe.19,	Q	0.50
Kennecott	New York	63⅞	63	63½	Ju. 3, Jy. 1	Q	1.25
Magma Copper	New York	37⅞	36½	36⅝	Ma.31,Ap.15,	Q	0.75
Mason Valley	N. Y. Curb	1¼	1⅛	1⅛			
Miami Copper	New York	15	14⅝	15	My.2,My.16	Q	0.37½
Mohawk	Boston	40½	40	40	Ap.30, Jn.1	Q	1.00
Mother Lode Coal	New York	3¼	2⅞	2⅞	Jn.10, Jn.30		0.25
Nevada Consol	New York	14½	14¼	14¼	Jn. 3, Jn. 7	Q	0.37½
New Cornelia	Boston	21⅛	20⅜	20⅜	My.6, My.23	Q	0.50
Noranda	N. Y. Curb	22⅜	21½	22⅛			
North Butte	Boston	1⅛	1 1/16	1⅛	Oct., 1918		0.25
Ohio Copper	N. Y. Curb	*65	*59	*63	Sept. 1926		0.03
Old Dominion	Boston	12½	12	12	Dec., 1918		1.00
Phelps Dodge	N. Y. Curb	115	115	115	Ma.22, Apr.2	Q	1.50
Quincy	Boston	17	16	16	March, 1920		1.00
Ray Consolidated	New York	15⅛	15	15	Ap.20, Ap. 30		0.25
St. Mary's Min. Ld.	Boston	22⅞	22⅛	22⅛	Fe.10, Ma.10		2.00
Seneca Copper	New York	3⅜	3	3¼			
Shattuck-Denn	Boston Curb	4	3⅞	3⅞			
Tenn. C. & C	New York	8⅜	8⅛	8⅛	My.31,Ju.15,	Q	0.12½
United Verde Ex	N. Y. Curb	24	23⅝	23⅝	Apr.6, May1	Q	0.75
Utah Copper	New York			115	Jn. 17, Jn. 30	Q	1.50
Utah Metal & T	Boston	1¼	1⅛	1⅛	Dec., 1917		0.30
Walker Mining	Salt Lake			*51			
NICKEL-COPPER							
Internat. Nickel	New York	71⅜	66⅝	69⅜	Jn. 16, Jn. 30	Q	0.50
Internat. Nickel pfd.	New York			105	Ap. 14, My. 2	Q	1.50
LEAD							
Gladstone Mtn	Spokane	*24⅜	*24	*24⅜	April, 1927		0.005
National Lead	New York	105	100¼	101⅛	Jn. 10,Jn.30	Q	1.25
National Lead pfd	New York	132½	132	132	My.10,Jn.15	Q	1.75
St. Joseph Lead	New York	39½	38½	38½	Se.10,Se.20,	QX	0.75
ZINC							
Am. Z. L. & S.	New York	8⅜	8	8	May, 1917		1.00
Am. Z. L. & S. pfd.	New York	47½	46	46	Nov., 1920		1.50
Butte C. & Z.	New York	4½	4⅛	4⅛	De. 9, De. 24		0.50
Butte & Superior	New York	9⅞	9	9¼	Jn. 17, Jn. 30	Q	0.50
Callahan Zn-Ld	New York	1⅝	1½	1½	Dec., 1920		0.50
Consol.Lead&Zinc'A'	St. Louis	13	12½	12⅝	Ma.15, Ap.1	Q	0.25
Eagle-Picher	Cincinnati	27⅜	26⅜	27	Au.15,Se.1	Q	0.40
Eagle-Picher pfd	Cincinnati			116	Jn.30, Jy.15	Q	1.50
New Jersey Zn	N. Y. Curb	184½	180	180	Jn.20, Jy.9	QX	2.00
United Zinc	N. Y. Curb			*55			
Yellow Pine	Los Angeles	*30	*25	*28	Dec. 1925	Q	0.04
GOLD							
Alaska Juneau	New York	1¼	1⅛	1⅛			
Argonaut	Toronto	*46	*38½	*38½			
Barry-Hollinger	Toronto	*39	*33	*34			
Consol W. Dome L.	Toronto	*7¼	*6⅝	*7⅛			
Cresson Consol. G.	N. Y. Curb	2	2	2	Ma.31,Ap.10	Q	0.10
Dome Mines	New York	7⅜	7¼	7¼	Jn.30, Jy.20	Q	0.25
Golden Cycle	Colo.Springs	†1.63	†1.61		My.31, Jn.10	Q	0.04
Hollinger Consol	Toronto	19.95	19.60	19.85	Jn. 1, Jn 17		0.10
Homestake Mining	New York	61	60½	61	Jn. 24, Jn. 25	M	0.50
Kirkland Lake	Toronto	1.55	1.38	1.40			
Lake Shore	Toronto	19.85	19.50	19.65	Jn.1, Jn.1	X	0.20
McIntyre-Porcupine	New York			25	My.2, Jn.1	Q	0.25
Portland	Colo.Springs	†*45	†*40		Ap.6, Ap.15,	Q	0.02
Rand Mines	New York			9½	Au.23-30	Am.Sh.	1.52
Teck-Hughes	Toronto	7.72	7.35	7.70	Ja.31, Fe.1		0.05
Tom Reed	Los Angeles	*37½	*37½	*37½	Dec., 1926		0.02
Tough-Oakes	Toronto	*57	*50	*55			
United Eastern	N. Y. Curb			*35	July, 1924		0.05
Vipond Cons	Toronto	1.10	*90	*95	Apr.1, Apr.15		0.03
Wright-Hargreaves	Toronto	5.90	5.70	5.85	Ap.15,My.2		0.10‖
GOLD AND SILVER							
Carnegie Metals	Pittsburgh	.13	11⅞	13			
Con. Cortez	N. Y. Curb			*19			
Con. Virginia	San Francisco	*3½	*3⅓	*3⅓			
Dolores Esperanza	N. Y. Curb	*55	*51	*51	July, 1923		0.05
Premier Gold	N. Y. Curb	2	2	2	Jn. 14, Jy. 5		0.08
Tonopah Belmont	N. Y. Curb	1⅝	1½	1½	Ma.15, Ap.4		0.08
Tonopah Extension	N. Y. Curb	*28	*28	*28	Apr. 1925		0.05
Tonopah Mining	N. Y. Curb	2½	2½	2½	Ma.31, Apr.21		0.07½
West End Consol	N. Y. Curb	*10	*10	*10	Mar., 1923		0.05
Yukon Gold	N. Y. Curb			*45	June, 1918		0.02
SILVER							
Beaver Consol	Toronto	1.22	1.10	1.10	May, 1920		0.03
Canadian Lorrain	Toronto	*25	*23	*25			
Castle-Trethewey	Toronto	*85	*83	*85			
Coniagas	Toronto	3.42	3.25	3.25	May, 1924		0.12½
Keeley	Toronto	1.30	1.25	1.30	Fe.28, Ma.15	X	0.12
Lorrain Trout Lake	Toronto	*70	*60	*60	July, 1925		0.05
McKinley-Dar.-Sav	Toronto	*16½	*16	*16¼	Oct., 1920		0.03
Mining Corp. Can	Toronto	3.65	3.20	3.34	De. 30, Ja. 15		0.12½
Nipissing	N. Y. Curb	6	5⅞	5⅞	Ma.31,Ap.20	Q	0.15

Stock	Exch.	High	Low	Last		Last	Div.
SILVER-LEAD							
Ahumada	New York	3	2⅞	3	Ma. 25,Ap.4,Q	X	0.12½
Bingham Mines	Boston	47	43½	46¼	Ma.21, Ap. 5	Q	1.00
BunkerHill&Sullivan	N. Y. Curb	97	96¼	96⅜	My.31, Jn.4	X	0.50
Cardiff M. & M	Salt Lake	*50	*45	*45	Feb. 5, 1927		0.10
Chief Consol	Salt Lake	2.65	2.45	2.65	Nov., 1926	Q	0.10
Consti'n Mng.&Mill'g	Spokane	*34	*30	*33			
Erupcion	Boston Curb			*49	Ma. 25, Ap. 2	Q	0.07½
Eureka Lily	Salt Lake	1.52½	1.37½	1.50			
Federal M. & S.	New York	154	145	152½			
Federal M. & S. pfd.	New York	95½	94	94	My.25, Ju.15	Q	1.75
Hecla Mining	N. Y. Curb	14⅝	14⅝	14⅞	My.4, Ju. 15	Q	0.25
Highland-Surprise	Spokane	9½	9	9½			
Iron King Mining	Salt Lake	*55	*49	*50			
Keystone Mining	Salt Lake	*27½	*27	*27½	Au. 12, Au. 26		0.07½
Lucky Jim	Spokane	*20½	*19½	*19½			
Lucky Tiger-Com	Kansas City	†7.00	†6.60		My. 10, My. 20		0.05
Mammoth Mining	Salt Lake	1.82½	1.75	1.75	Jn.10, Jn.20	Q	0.05
Marsh Mines	Spokane	1⅜	1⅛	1⅛			
North Lily	Salt Lake	3.30	3.25	3.30			
Park Utah	New York	7	6⅜	6⅞	Jn. 25, Jy. 1	Q	0.20
Plutus Mining	alt Lake	....	....	1.85	Ja. 10, Ja. 15	Q	0.10
San Rafael	San Francisco			*24			
Silver King Coal	Salt Lake	8.00	7.80	8.00	Jn. 20, Jy. 1		0.25
Silversmith	Spokane	*40	*39	*39	Oct., 1926	Q	0.02
Stratton Mines	Spokane	*55	*43	*46			
Sunshine M. Co.	Spokane	*84	*71	*74			
Tamarack-Custer	Spokane	*31	*26	*31	Sept., 1924		0.25
Tintic Standard	Salt Lake	11.37½	11.25	11.37½	Jn.15, Jn.28		0.40
Utah-Apex	Boston	5	4¼	4⅜	Oct., 1926		0.25
IRON							
Bethlehem Steel	New York	51½	49¾	49¾	July, 1924		1.25
Cleveland-Clifis Iron	Cleveland	84	78	83½	Ja. 15, Ja. 25	Q	1.00
Colorado Fuel & Iron	New York	89½	85⅞	87	May, 1921		0.75
Gt. North'n Iron Ore	New York	90½	89	89	Dec. 6, Dec. 28		0.75
Inland Steel	New York	53¼	50	50½	My. 13, Jn. 1	Q	0.62½
Replogle Steel	New York			12½			
Republic I. & S.	New York	67⅞	66½	67	My. 14, Jn. 1	Q	1.00
Republic I. & S. pfd.	New York	105½	105	105	Jn. 14, Jy. 1	Q	1.75
Sloss-Sheffield S. & I.	New York	124	124	124	Jn. 10, Ju. 20	Q	1.50
Sloss-Shef. S.&I. pfd.	New York	107½	107½	107½	Jn. 20, Jy. 1	Q	1.75
U. S. Steel	New York	124⅞	121⅝	122	Jn. 7, Jn. 29	Q	1.75
U. S. Steel, pfd.	New York	133½	132¼	132½	My.2, My.28	Q	1.75
Virginia I. C. & C.	New York	45¼	45¼	45¼	Jan., 1924		1.50
Virginia I.C.&C. pfd.	New York	....	....	60½	Ju. 15, Jy. 1		2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN							
De Beers Consol	New York	....	....	30¼	Ja. 26, Ja. 29		1.45
So. Am. G. & P. New	N. Y. Curb	3	2⅞	3			
Alum. Co. of Amer	N. Y. Curb	81⅞	69	80			
Alum. Co. of Amer.pf	N. Y. Curb	104½	104	104	Jn. 15, Jy. 1	Q	1.50
Vanadium Corp	New York	49	47¼	47⅜	My. 2, My. 16	Q	0.75
Patino M. & E.	New York	22⅜	21⅜	21⅜	Ap. 27, My. 5		1 sh.
ASBESTOS							
Asbestos Corp	Montreal	24⅜	23¼	24	Jan., 1926		1.50
Asbestos Corp. pfd.	Montreal	90	88	89⅞	Ma.31, Ap.15	Q	1.75
SULPHUR							
Freeport, Texas	New York	73⅛	65½	72	Ap. 15, My. 2	Q	1.00
Texas Gulf	New York	62½	57¾	62¼	Ju. 1, Ju. 15	Q	1.00
MINING, SMELTING, REFINING AND GENERAL							
Amer. Metal	New York	41	40¾	40¾	My. 20, Ju. 1	Q	0.75
Amer. Metal, pfd.	New York	108¼	108	108	My. 21, Ju. 1	Q	1.75
Amer. Sm. & Ref.	New York	164¼	159⅜	161	Ap.14, My.2	Q	2.00
Amer. Sm. & Ref. pfd.	New York	125	124½	125	My. 6, Jn. 1	Q	1.75
Consol. M. & S.	Montreal	251½	245	245	Jn. 30, Jy. 15	X	6.25
Newmont Mining	N. Y. Curb	73⅞	73	73⅞	Ma.31, Ap.15	Q	0.60
U. S. Sm. R. & M.	New York	36⅝	35⅝	35⅝	Ap. 7, Ap. 15	Q	0.87½
U.S. Sm. R.&M. pfd.	New York	48⅝	48½	48½	Ap. 7, Ap. 15	Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED May 31, 1927

Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	89/4½	86/6½	87/6	May, 1927	5 p.c. (†)
British Platinum (£1)	3/3	2/7½	3/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/4½	14/9	14/10½	Feb., 1927	6 annas*
Bwana M'Kubwa (5s)	6/—	5/6	5/7½		
Camp Bird (2s)	4/—	3/10½	4/—		
El Oro (£1)	4/4½	4/—	4/3	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/4	—/1½	—/3		
Frontino & Bolivia (£1)	12/9	12/6	12/6	Jan., 1927	5 p.c.
Mexican Corpn. (£1)	11/3	10/6	10/9		
Mexico Mines of El Oro (£1)	21/—	16/3	17/6	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	12/6	11/3	11/3		
Oroville Dredging (£1)	5/9	5/6	5/9	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	2/—	1/9	2/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	56/10½	55/—	55/—		
St. John del Rey (£1)	11/3	10/—	11/—	May, 1927	3¾ p.c.
San Francisco Mines (10s)	32/4½	30/6	31/—	Jan., 1927	25s.
Santa Gertrudis (£1)	17/9	17/4½	17/6	Jan., 1927	3¾ p.c.
Selukwe (2s. 6d.)	8/10½	7/—	8/6	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/3	3/—	3/—	Nov., 1917	75 p.c.
Tanganyika (£1)	62/6	48/4½	48/9	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	9.690	9.250	9.450	July, 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs. and free of taxation.

New Machinery and Inventions

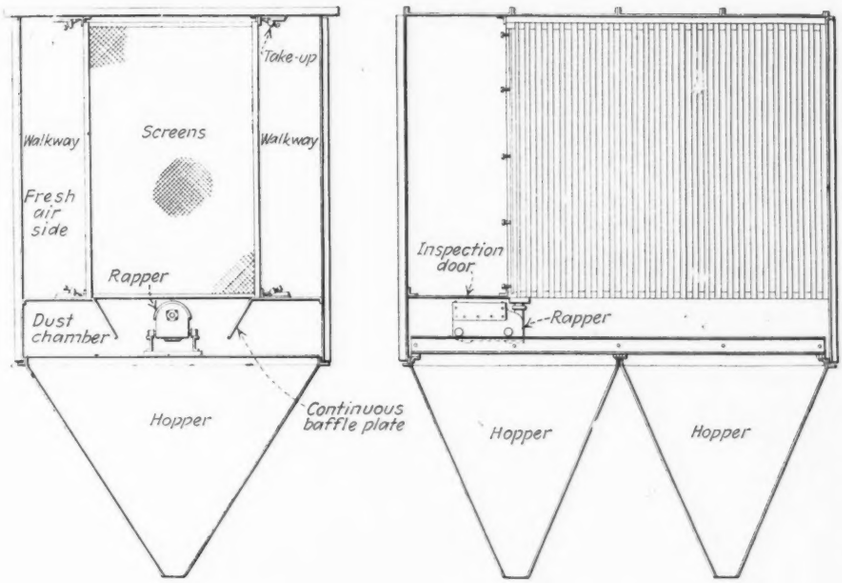


Diagram of new Norblo screen vibrator

Dust Arrester Screen Vibrator

As is well known, the cloth-screen type dust arrester is one of the most generally adaptable and useful kinds of dust-collecting apparatus now available for the average installation in which continuous operation or classifying is not essential. Owing, however, to the necessity of periodically freeing the screens from the dust which accumulates on them and which would otherwise impair the filtering capacity, it is essential every few hours to set in operation a rapping device which will vibrate the screens and thus shake off the accumulations into the hoppers below. Hitherto this has been accomplished by means of spring pistons, either air-operated or mechanically driven, and actuated by cams on a revolving shaft extending the entire length of the screen gangs. Such devices, however, are necessarily subject to considerable wear, especially because, as a rule, they receive little or no attention. Furthermore, unless the cams and the pistons are spaced fairly closely together it may happen that the screens situated between the shaking points may receive less than their proper measure of shaking. A further difficulty occurs in cases where the length of the screen gangs is considerable, because the longer the shaft the more difficult it becomes to eliminate spring and bending unless the diameter of the shaft be decidedly increased—which naturally adds to the cost.

It is claimed that the screen vibrator now being adopted as standard practice on all of the larger models of Norblo cloth screen-type dust arresters manufactured by Northern Blower Co., Cleveland, Ohio, avoids these difficulties. The design, for which the Northern Blower Co. has applied for a patent, is radically different from all other previously made vibrating devices. It consists of a single electrically operated rapper which travels slowly on rails from end to end of the screen gang, vibrating each individual screen thoroughly as it passes under it. Since only one rapping piston is necessary, this is constructed in the most substantial manner, ball bearings being provided throughout the device and all parts being thoroughly protected from the surrounding dust by a strong, dust-proof, cast-iron case. All bearings are packed with many months' supply of grease, and the mechanism, according to the manufacturers, will work without attention or replacement of parts for at least one year from the date of installation.

The operating motor is fed from a set of trolley wires by means of a double collector arm, and drives the spring-rapping piston through a bevel reduction gear. The gear shaft carries a cam which operates the rapping piston against the action of a powerful spring, thus giving a very rapid succession of upward blows to the under side of the screen gang frame. At the same time the entire mechanism is driven slowly along the rails by means of a steel worm and wheel. The whole equipment, including the rails, is protected from the weather by an air-tight case in which the screens are placed.

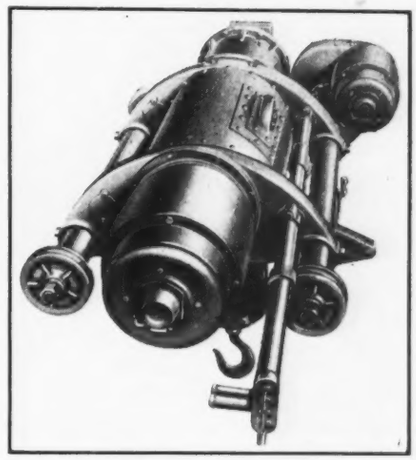
Sequence of operations is as follows: The attendant shuts off the exhaust fan and then presses a push button, which starts the rapping and traveling mechanism of the screen vibrator. When the vibrator reaches the end of its travel, it automatically engages with a reversing relay switch and begins to return to its starting point. On reaching its original position, it automatically shuts off the current and stops itself. The exhaust fan may now be restarted, although for the most effective cleansing of the screens it is advisable to allow a few moments for the dislodged dust to settle into the hoppers below the screens.

Crane Trolley Can Be Built for the Job

A new standard type crane trolley has been developed by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. The sectionalized manner of construction of these crane trolleys in changeable sections permits each trolley to be built up of units suitable for the service intended, instead of an arbitrary combination in which a high hoisting speed would necessitate an increase in the size of the entire trolley, entailing size and cost not justified by the service imposed upon the machine.

Steel plate and angle construction of the body portion of the hoist frame, axle brackets of steel tubing, all of which can be made readily of unusual dimensions, without new pattern construction or changes, permit special dimensions, when necessary, at low cost. In developing this new design care has been exercised that clearances be made as small as possible, providing a compact trolley in every respect, including a special low headroom type for conditions where overhead clearances are extremely limited.

The load-carrying frame of this latest type of trolley is of all-steel construction, consisting of box section girts. This composite frame, unlike any solid frame, whether of iron or steel, is, because of its composite construction, free from shrinkage stresses, and because of this fact it does not change form; hence its exact trueness is unaffected by seasoning or by loading while in use. The frame is carried by axle brackets consisting of heavy seamless drawn-steel tubes, passing through bored openings in the girts; hence the



Sectionalized construction permits design to suit many conditions and sizes

entire load-carrying structure from trolley wheels to winding drum is of steel.

The longer winding drum of the new trolley permits grooving of a coarser pitch for a given size of rope, to a depth exceeding half the diameter of the rope. The drums are cast on end of semi-steel, insuring freedom from defects, greater strength, and resistance to wear.

Two optional types of mounting for hoist motor are provided: by bolting the field frame to the motor and adapter, or on its base by the use of a

motor end adapter, affording a horizontal shelf to which the motor is bolted. The trolley motor, like the hoist motor, may be mounted by bolting its field frame to an adapter, or as an alternative upon its feet on a shelf near the center of the driven axle bracket. Any type of motor, solid or split frame, of appropriate size may be used.

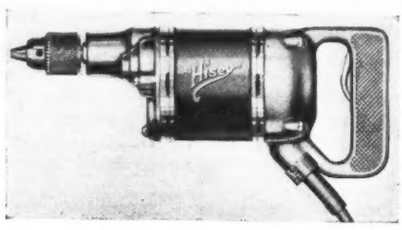
Trolley axles are of heavy construction, the bearings of which are waste-packed and supplied with oil cellars communicating with a pool retained within the axle bracket tubes. Oil for all four bearings is supplied through a single pipe connecting both axle bracket tubes. Trolley wheels are securely fastened to axles. The wheel at one end of each axle is pressed or shrunk on; the wheel at the opposite end is drawn onto a taper by a nut, which makes this wheel perfectly secure, yet easily removable. Trolley gearing, although similar to former designs, has been made more ample in size, affording gears larger in diameter and higher gear ratios. The load block is fully inclosed, thereby preventing accidents that are caused by workmen getting their hands caught between the rope and the sheave.

Standard-Duty ¼-In. Universal Drill

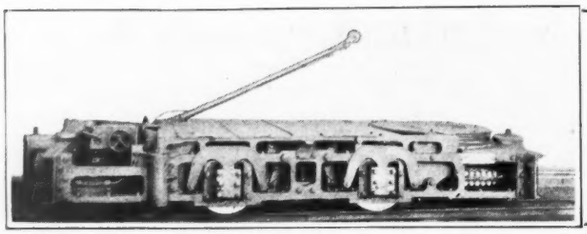
Marketing of the new Hisey standard-duty type 18-CU, ¼-in. universal electric drill, shown in the accompanying illustration, is announced by the Hisey-Wolf Machine Co., Cincinnati, Ohio.

Like other Hisey drills, this unit is equipped with a standard electric motor of this company's design and manufacture which is said to be particularly adapted for the service. The motor is mounted on ball bearings, which in turn are fitted in a way to eliminate slip and creeping action, it is stated. Also, the gear on the armature shaft is removable. All gears are made of high-grade steel, electrically heat-treated. The compound gear shaft is supported with a bearing at each end. The Jacobs chuck, which is standard equipment, is fitted to a hardened and ground, tapered spindle. The chuck spindle is automatically lubricated through the gear case.

Including other construction features, brush-holders with adjustable spring tension are mounted as a separate unit on a Bakelite yoke to facilitate brush adjustment when necessary. The end handle cover is a strong casting which carries the pressure applied, and being independent of the motor and motor bearings relieves them of strain. The automatic, quick-release-type switch is mounted in the end grip handle.



Hisey type 18-CU, ¼-in. universal electric drill

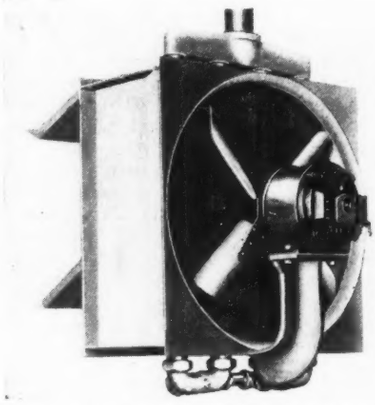


A 4-ton gathering locomotive which is less than 2 ft. high

Wedge-Core Unit Heater

Announcement is made of the marketing of the Herman-Nelson unit heater by the Herman-Nelson Corporation, Moline, Ill. A view of the assembled unit is shown in the accompanying illustration. A feature of this heater emphasized by the manufacturer is that it is built to withstand steam pressures up to 100 or 125 lb. and displaces heavy pipe coils, which have commonly been used on high-pressure work. A special feature is the aluminum radiating fins on the Univent steam radiator sections. This heater is especially designed for heating factories, warehouses, garages, and other industrial buildings.

The model 20 heater, shown here, weighs approximately 170 lb. complete with motor and louvre deflector and occupies 4 cu.ft. of overhead space.



Herman-Nelson model 20 unit heater

When the motor is operating at 1,150 r.p.m., it is stated that the fan on each unit will deliver in excess of 2,000 cu.ft. per minute and that at 850 r.p.m. it will deliver in excess of 1,200 cu.ft. of air per minute.

It is stated also that it will operate at any steam pressure from atmospheric to 125 lb. When operating at 1,150 r.p.m., with inlet air at 50 deg. and steam pressure at 5 lb., it will deliver the equivalent of 560 sq.ft. of radiation. The same unit with inlet air at 50 deg. and with 100 lb. working steam pressure will deliver the equivalent of 960 sq.ft. of radiation.

Each unit may be automatically or manually controlled without reference to any other unit.

The radiator is of the extended surface type, but differs in that the core or steam way in it is cast in one piece of a special alloy and the aluminum fins are wedged on the one-piece cast core and held in a metal-to-metal contact by spring action. Likelihood of leakage is thus eliminated, according to the manufacturer.

Lowest and Slowest Locomotive Built

Modern trends in the development of haulage and gathering types of motive-power units are indicated in the Baldwin-Westinghouse mine locomotive shown in the accompanying illustration. This four-ton gathering locomotive is the lowest and slowest of this type ever built and meets the demand for motive power for working thin seams. It has an over-all height of 23⅞ in. and speeds up to 2¼ miles an hour when operating from conductor cable and 6 miles an hour when operating from the trolley.

Some of the features of design include semi-magnetic control, bar-steel frames, self-equalizing coil springs, spacious accommodations for motorman, ball-bearing motors, vertical-type cable reel, new type resistor, and other standard practices.

New Locking Cord Connector

The new Hubbell cord-grip locking connector, with a rated capacity of 110 amp., 250 volts, has recently been announced by Harvey Hubbell, Inc., Bridgeport, Conn.

After plugging the cap into the connector, a slight turn is said to be all that is necessary to lock the two parts securely together.

The locking feature of this connector provides an extra and, it is claimed, very effective safeguard against accidental disconnection. This is of distinct advantage in industrial plants and other places, particularly where the service is unusually severe or where connectors are subjected to considerable vibration. These connectors are built for hard service, the bodies being made of a strong, black composition and the caps being completely armored by a heavy shield of steel, which is heavily galvanized to prevent it from corroding.

Catalogs

Electrical Equipment—A generously illustrated publication describing the American Brown Boveri Co., New York, N. Y., and its equipment has just been distributed. It deals particularly with the Camden, N. J., plant, organization, and products and also recent engineering achievements in the power, railroad, dredge, harbor, marine, and industrial fields.

Automatic Combustion Control—Descriptive literature on automatic combustion control for furnaces, stokers, and powdered-fuel plants has been made available by the Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia.

Locomotives—Bulletin No. 1227, covering a special type mining locomotive, has been published by the Atlas Car & Manufacturing Co., Cleveland, Ohio.